Analysing determinants of housing tenure

A cross sectional analysis in the City of Tshwane Metropolitan

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Presented By

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Authors Declaration

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OPSOMMING

Volgens die sensus 2011 is die ampstermyn verdeel in vyf kategorieë: "Besit, maar nog nie afbetaal nie", "Eienaar en ten volle afbetaal", "gehuur", "bewoon en huurvry" en "ander amptenaar". Die integrale fokus van die studie is op besit besit verkry met ander verwante veranderlikes uit die 2011 sensus data. Die doel van die studie was dus om die kritiese faktore wat die verspreiding van besitreg in die Tshwane Metropolitaanse Munisipaliteit beïnvloed, ruimtelik te ondersoek ten einde huishoudings se behuisingsloopbaan en lokasiemobiliteit deur huishoudelike hoof (HH) ouderdom en bevolkingsgroep in verskillende inkomste te modelleer. gebiede. Die studie het 'n bivariate korrelasie, geografiese geweegde regressie-analise toegepas om stadiums te bepaal waarin huishoudings besit verkry het ten opsigte van sosio-demografiese en ekonomiese veranderlikes. Gewoonste Kleinste Plein (OLS) het ruimtegewens die wisselende verhoudings en vasgestelde homogene groeperings in terme van hul ewekansigheid gemodelleer. Die resultate van die studie het getoon dat die hipotese waar was met die bevindings dat "besit, maar nie ten volle afbetaal nie" by "HH ouderdomsgroep 35 - 49". So 'n verblyf was egter ook groter vir die blanke bevolkingsgroep by "HH ouderdomsgroep 20 - 34" in vergelyking met ander groepe. Ongelukkig weerspreek die besit van 'besit en ten volle afbetaal' die hipotese op grond daarvan dat dit oorheersend en groter was by HH-ouderdomsgroepe bo 50. Daarbenewens was beide tipes eienaarskap sterk geklust op spesifieke gebiede binne die studiegebied.

ABSTRACT

According to the census 2011 tenure is, divided into five categories: "*Owned but not yet paid off*", "*Owned and fully paid off*", *"rented",* "*occupied and rent free*" and "*tenure other".* The integral focus of the study is on owned tenure sourced with other related variables from the 2011 census data. Thus the purpose of the study was to explore spatially the critical factors that influence the distribution of owned tenure in the Tshwane Metropolitan Municipality, in order to model households' housing career and locational mobility by household head (HH) age and population group in different income areas. The study applied a bivariate correlation, geographic weighted regression analysis in order to ascertain stages in which households attained owned tenure in relation to socio-demographic and economic variables. Ordinary Least Square (OLS) modelled spatially the varying relationships and determined homogenous groupings in terms of their randomness, the results of the study revealed that the hypothesis was true with the findings that "*Owned, but not fully paid off*" tenure was in large proportion at "*HH age group 35 – 49*". However, such tenure was also larger for the white population group at "*HH age group 20 – 34*" compared to other groups. Unfortunately, "*Owned and fully paid off*" tenure contradicted the hypothesis on the basis that it was dominant and larger at HH age groups above 50. Moreover, both types of ownership were highly clustered in specific areas within the study area.

Keywords and phrases: Tenure; owned but not fully paid off; owned and fully paid off

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DEFINITIONS OF KEY TERMS, CONCEPTS AND VARIABLES

The concepts and definitions contained in the table below were selected specifically because they feature on several occasions throughout the document.

Acronym/Concepts	Definitions/Meaning
CS 2016	Community Survey 2016: is a mini-census conducted every 10 years between official censuses.
EA types	Enumeration Areas types
HH	Household Head
MSDF	City of Tshwane Municipal Spatial Development Framework
OLS	Ordinary Least Squares
Stats SA	Statistics South Africa

CHAPTER ONE: FRAME OF REFERENCE

1.1 BACKGROUND

Housing consumes most of South Africa's household expenditure, followed by transport (Stats SA, 2016). If accomplished early, owned tenure can be associated with stable life and sense of well-being in a long run, specifically with consideration that, there would be less proportions of household pension income used to secure shelter upon retirement (Pacione, 2009; Carasso et al, 2005). The inverse is true that households who did not obtain full ownership by retirement years, would be worse off upon retirement stage in comparison with their active employment years. Delayed housing ownership is drastically affected by volatile housing costs, income levels and socio-demographic factors; hence rented tenure may temporarily prove economically rational (Carasso et al, 2005), while the savings are invested somewhere else other than in housing (Turner, 2000). Therefore housing cost has the potential to influence levels of well-being in the household's life cycle (Staikos, 2012), specifically within types of neighbourhood. Rafferty (2016) links well-being and housing ownership with the following variables: accessibility, affordability, and locality, availability of services, habitability and security of tenure.

Of the elements of tenure, ownership is integral because virtues of a households' wellbeing are entirely dependent on the ability to secure shelter. Whether fully paid or not yet paid off, ownership derives economic means for those who achieve it and is regarded as a physical supportive environment for senior citizens (Lee, 2003), particularly on the basis that income levels tends to decline with increasing age (Ellsaesser, 2002). Carter (2009. p24) describes this as "*crowning achievements in a person's life cycle*". Again, households living in rented dwellings during their active years of employment would either relocate, upon retirement, to areas where cost of living is lower or have to use larger proportion of pension income in shelter security. Thus, there is an increasing rate of younger people moving into the city leading to less population of younger people and higher population of senior citizens in rural areas (Ellsaesser, 2002). Concisely, neighbourhood change involves a transition from one tenure status to another i.e. change from *"rented"* to ownership (Lu, 2009).

1.2 THE PROBLEM STATEMENT

Consumption variation is expected across different socio-demographic and economic groupings. These independent variables are necessary to measure social structures within neighbourhoods with respect to tenure choice. Currie and Senbergs (2007) have argued that there is also a strong observable relationship between income and location. Accordingly, trade-offs are expected to occur as households may deem consumption of specific goods more important than others do at particular moments in time. For instance, young households may trade off housing ownership for rentals in

order to balance both transportation and shelter needs, because rentals may be economically viable on short-term basis.

1.3 AIM OF THE STUDY

The purpose of the study is to explore spatially the critical factors that influence the distribution of tenure in the Tshwane Metropolitan Municipality, in order to model households' housing career and locational mobility by household head (HH) age and population group in different income areas.

1.4 OBJECTIVES OF THE STUDY

There are two objectives formulated for understanding the factors affecting tenure in the study area, and these are:

a) To investigate the life cycle stages in which households attain owned tenure in relation to socio-demographic and economic variables.

b) To explore spatial variability and distributional patterns of tenure in relation to socio-demographic and economic variables.

1.5 THE HYPOTHESIS

The study hypothesises that: 1) owned tenure is larger on average for people between the Household Head (HH) ages of 35 and 49 across the entire study area. 2) In white population groups, owned tenure is higher between the HH ages of 20 - 34 as opposed to other population groups where owned tenure is lowest at this age group. This is mainly because white population group between household ages of 20 - 34 earn higher income compared to other population groups. Moreover, considering the durations necessary for individual households to find stable employment and income, securing ownership at these age groups would be associated with a sense of wellbeing and stable life, because households would use a lower proportion of retirement income to pay off the housing bonds. 3) Thus, the distribution pattern of tenure across different age and population groups is observable in homogenous groupings within the study area.

1.6 METHODOLOGICAL CONSIDERATIONS

The study adopted a positivist methodological approach due to its scientific approach and geographic dominated thinking, which embraces spatial connotation and comparison at regional/local scale over time (Michael, 2006). Again, City of Tshwane Metropolitan Municipality as a study area is a result of purposive selection. The study area is comprised of seven planning regions with unique characteristics in terms of their population groups and socio-economic dynamics. The study area boundary was used to select spatial and non-spatial information or attributes critical for

analysis in the study. All datasets analysed, were of secondary status and covered the entire population within the study. A bivariate correlation analysis was conducted in order to establish relationships amongst variables. Geographical weighted regression modelled spatially the varying relationships between tenure categories and the HH household age and population age groups. Additionally, Ordinary Least Squares (OLS) analysis identified areas with homogenous characteristics in terms Owned tenure in the income areas.

1.7 THESIS OUTLINE

Figure 1 denotes thesis outline and details summaries for each chapter of this study

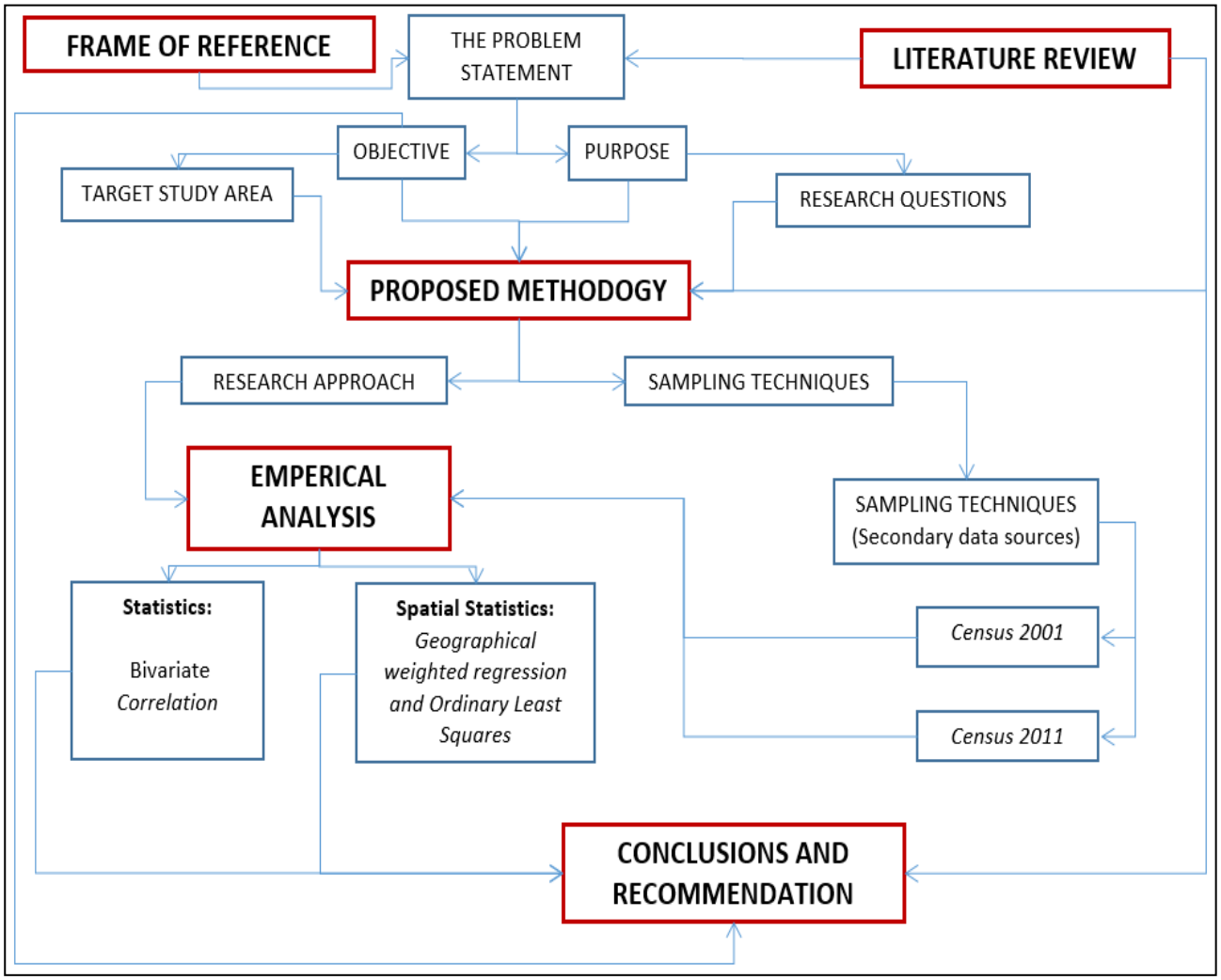

Figure 1: Thesis outline

CHAPTER ONE: FRAME OF REFERENCE

This chapter summarises all content pertaining to the research presented in this thesis document. It includes aim and objectives, the hypothesis, research questions and target study area. Brief literature review is included in the background to pave way for clear understanding of the problem statement as well as the overall overview concerning all chapters.

CHAPTER TWO: LITERATURE REVIEW

This chapter presents a detailed literature review and demonstrates in-depth discussion of empirical research in order to identify in the body of knowledge, the trends in line with the problem statement of the study. Concepts reviewed include previous studies, housing tenure trends and affordability.

CHAPTER THREE: METHODOLOGICAL CONSIDERATIONS

The core of the study relies on the methodological considerations necessary to achieve the objectives of the study. This chapter presents arguments that led to the selection of the unit area of analysis, variables and methods of analysis. The analysis is in two parts – first, the traditional statistics using correlations; and second the spatial statistics with specific interest on mapping geographic distribution.

CHAPTER FOUR: RESULTS AND DISCUSSION

This chapter presents discussion of the analysis regarding the socio-demographic, housing and economic characteristics as independent variables influencing housing tenure during household life cycle.

CHAPTER FIVE: CONCLUSION AND RECOMMENDATION

This is a conclusion chapter detailing the overall purpose of the study, achievements and limitations encountered during the course of the study. Also included in this chapter are the recommendations for future studies.

CHAPTER TWO: LITERATURE REVIEW

2.1 INTRODUCTION

A household refers to a basic unit of a neighbourhood structure or residential organisation which consists of either nuclear families; single parent families as result of divorce; widowed or a non-marital affair; persons living alone or collectively in non-related households; childless couples and "empty nester" households, whose children have left home as adults have their own homes (Knox, 2017). These diverse household types play a critical role in the distributional patterns of tenure across the housing career life cycle. Life cycles relate to the individual progression from childhood to retirement, starting as a child dependant on the parents for housing, then as an adult transitioning from renter, buyer to retiree. The traditional chronological stages of life cycle for most households as depicted by Duval's work, quoted by Beamish et al (2001; cited in Shi, 2005), include: Single stage, Couple stage, Childbearing family stage, Pre-school family stage, School-age family stage, Launching family stage, Middle-age family stage, and ageing family stage. These exclude delayed marriages, divorces, remarriages and same sex unions. Thus the single stage entails a household without children present or partner, the ageing family are those households in their retirement, while rest of the stages in between relate to households involved in child bearing, rearing and child leaving home at the adult ages, thereby influencing housing tenure with varying degrees and affecting household's decision making process (Shi, 2005).

According to Phago (2010), economic classes of urban settlements are distinguishable in such a manner that comprises affluent suburbs, black townships, informal settlements, as well as government RDP settlements. Tenure is associated with state housing subsidies leading to ownership ethical problems (Pacione, 2009). As a result, township dwellers do not necessarily view the properties they occupy as means of wealth, but rather for its utility value. Thus, the high-income and upper middle-income households have more options regarding the choice selection of a neighbourhood than the low and no-income households (Turner, 2000).

2.2 CHARACTERISTICS INVOLVED IN THE DECISION FOR HOUSING TENURE

Turner (2000) concluded that housing ownership increases proportionally to the number of children in the household and Zhou (2013) related owned tenure with stable life. Subsequently, Zhou (2013) concluded that young people are less interested in the ownership of tenure. On the contrary, Banks et al (2004) insinuated that middle-aged individuals would prefer ownership than rental tenure and considered investment in housing in their early life cycle as a way to secure future price volatility. In China, younger households (<40 age group) need multiple sources of income towards owned tenure, while older generations (>50 age group) with low-income require subsidised and affordable housing (Li, 2011). However, subsidised housing has negative impacts on the unsubsidised households of the neighbourhood (James, 2008; cited in Chen, 2012). This entails biasness towards those that

cannot afford housing against the deemed well off households. Moreover, Phago (2010) indicated that RDP housing leads to dysfunctional societies, causing spatial displacement of households to areas stricken with inadequate transport or economic opportunities. This view is however not entirely true, because housing development in the urban periphery may lead to decentralisation of certain economic activities, which were concentrated in the city centres.

There are Socio-economic inequalities prevalent leading to the spatial segregation of land uses (Gamba, 2011). Thus, not only are these areas dysfunctional but they are also characterised by other spillovers such as unemployment, crime and drug abuse (Phago, 2010). Moreover, constant changes resulting from residential settlement decision affect neighbourhood well-being (Kim, 1987). Turner (2000) and Zhou (2013) indicated that socio-demographic and economic are factors influencing tenure choices for both the young and the old. Moreover, Zhou (2013) further stated that the dismantled traditional nuclear family structure increases inequalities, wherein female-headed households are less likely to own housing compared to male-headed households. Concisely, nuclear family households have increased chances of becoming housing owners than the other types of households (i.e. Single-persons, Single parent households or Non-related households). The same is applicable for couples compared to single person households (Turner, 2000 and Carasso et al, 2005).

Although formal income determines tenure choice as high-income household correlates strongly with housing ownership (Drew, 2014), down payment, accessibility to loans and employment market structure are equally important factors towards tenure Addae-Mensa (1998). Again, income does not affect all settlements, because of other dynamics associated with land procurement, i.e. acquiring land in South Africa entails land grabbing, informal settlement and formal processes. Land grabbing in this instance refers to illegal occupation contrary to the city by-laws. Moreover, Addae-Mensa (1998) findings concur with the notion that household income is not the sole determinant variable for ownership, but access to land, duration households planned to stay in the city, reasons for migration, marital status and size of the household are equally important.

Regarding population groups in terms of tenure distribution and wellbeing, borrower characteristics have significant impact on the total rate of returns for the low-income, low educated and black households (Nichols, 2005). Moreover, persons with some high school and college qualification are associated with higher probability to housing ownership; but (Zhou, 2013) indicated a week correlation exist between graduate qualification and the choice of housing ownership. Skobba (2008) suggested that low-income household's housing life cycles occur differently compared to middle-income and high-income households. Regardless of the mechanism to achieve ownership, its potential for wealth generation is important for neighbourhood stability. Thus, benefits driven by the low-income households are of limited wealth compared to high-income households (Mamgain, 2011). Some households are more sensitive to the investment risk of housing ownership (Turner,

2000). As a result, housing status and the dwelling type may differ amongst different income categories and household life cycles (Shi, 2005).

2.3 HOUSING AFFORDABILITY

Affordability refers to a specific relationship that exists between willingness and ability to pay for a particular tenure category (Morris, 1992). This means that the ability to meet financial commitment can be associated with a particular type of dwelling (Rafferty, 2016). Hence, affordability is area specific. Consequently, the inability to define levels of affordability results in inappropriate resource allocation and inactive implementation of policies by the state along with its stakeholders (Morris, 1992). Such failures on the part of the state increases the rates of non-delivery and recreates spatially segregated communities. Although, housing is viewed as the universal entitlement and a basic fundamental human need (Tagoe, 2014), not everyone holds this view since some regard it as consumer good instead of social entitlement (Pacione, 2009). Thus, it is an impure public good with both private and public capital characteristics. In the nutshell, housing in the US is a private entity (Phago, 2010) and largely market orientated. US government provides just a 1% housing towards social capital compared to Europe which regards housing as a universal entitlement (Pacione, 2009) or social right (Phago, 2010), even though failures in demand and supply led to alternative possibilities including co-operatives and owned tenure (Pacione, 2009).

Spatial displacement of communities in China was either encouraged through environmental, economic or social reasons, because of large infrastructure projects aimed at economic viability of the region-orientated livelihoods of the society (Westendorff, 2009). A study by Liang (2013) suggested that rural migrants and young people face difficulties in obtaining ownership and are more likely to consider rented tenure in urban environments. Such difficulties in accessing housing is attributed to their insecure household incomes (Westendorff, 2009), and employment instabilities (Carasso et. al, 2005). Consequently, high-income migrants locate in the affluent suburbs and gated communities based on the perception that outlying areas are associated with environmental and social benefits (Geyer and Geyer, 2014). The inverse is true that low-income migrants locate in the urban fringes because property rents are lower in the townships and state-subsidies of housing locate them mostly along urban peripheries (Gunter, 2011; Rafferty, 2016). In South Africa, townships were historically, designed to house non-whites and to limit them from the inner city's urban areas (Phago, 2010). Hence, it is crucial to understand that low-income and stable employment are not necessarily the only determinants of South African spatial settlement, but racial segregation was equally part.

Affordable housing stems from policy reformation for most countries, specifically those pursuing sustainable development goals. But, social state-subsidised housing are expensive to maintain mostly because there are no clear mechanisms on qualifying criteria, thus leading to the un-

qualifying higher-income households occupying housing initially developed for low-income earners (Morris, 2008). Consequently, most worker households' preference is in public housing and rental tenure (Huang, 2001). However, social housing in this context involves those properties built, maintained and owned by local authority branch of the state (The Social Housing Foundation, 2008; cited in Phago, 2010). South Africa is not exempt from such policy reformation, simply because of its right of access to adequate housing provisioned by section 26 of the Constitution Act 106 of 1996. Rafferty (2013) indicated that the needs of low-income earners are far-fetched from realisation. This is due to the increased pressure of housing demand exerted by those who can afford alternative accommodation (Radebe, 2000).

Based on its financial standing, a typical household would either consider the purchase of a house to satisfy family needs resulting in the autonomy and ownership, or choose rental housing and the investment of savings elsewhere (Turner, 2000). Moreover, the uncertainties associated with appreciation and depreciation of housing costs may pose major risks for housing owners, therefore affecting the consumer choices regarding owned tenure (Henderson and Ioannides, 1983; cited in Staikos, 2012). However, ownership tends to be beneficial over longer periods, specifically for long-term residents (Carasso et. al, 2005).

Apparently, risks are higher for those households with low incomes given the qualifying standard costs. Thus, it is 20% of household income in the UK, 30% in the US (Pacione, 2009) and also for South Africa, placing US affordability equal that of South Africa, thus making housing to be the greatest expenditure item on the household income's budget (Tagoe, 2014). The fallouts of determination for affordability are imprecise due to inability to measure clearly the proportion of income payable towards housing, i.e. affordability on gross instead of net wages without considerations for VAT increases, land rates and taxes chargeable based on location. Arguably, Rafferty (2016) attributes South Africa's unaffordability to high rates of unemployment.

There is risk of negative equity that takes place when the market value of the house falls below the home-loan outstanding amount (Pacione, 2009). Most households standing at the verge of losing equity are those who purchased housing when markets are near peak (Turner, 2000). Another factor influencing unaffordability involves housing price volatility (Park, 1994), thereby affecting new buyers' decision of. Thus, high-income households stand better chances of affordability regardless of discounts (Pacione, 2009). This translates to the fact that affluent suburb housing would trade at market value worth millions, while that of other neighbourhoods including the informal sector housing only trade for few thousands (Gunter, 2011). Unfortunately, down payments continue to rise along housing costs (Park, 1994), which further frustrates tenure choice. In China, middle-income and low-income households have at least 10 years on average to accumulate the down payment necessary for purchase of housing (Westendorff, 2009). This warrants higher interest rates for struggling households due to their credit risk (Carasso, 2005).

Although there are incentives generally offered including waiver for down payment to qualifying households, most families tend to spend larger portions of their income on housing preventing them from meeting other basic needs (Bentzinger, 2009; Phago, 2010). Under general circumstances, households that choose rented tenure do so, due to limited financial resources (Park, 1994) or due to the inability to raise down payment (Shi, 2005) or duration of stay in the city. Consequentially, these limits affect residential mobility. Alternatively, wealthier households are able to change their location of residence without changing their employment location. Thus, causing intra-urban shifts (Kim, 1987).

Production and environmental orientated migration motivations (Geyer and Geyer, 2014) are critically important because they influence duration of stay in the city. Production orientated migration relates to active employment years of individuals legible for economic means, while environmental orientated migration involves the movement of individuals from one region to another as a result of pleasure or retirement purposes. These migration motivations are responsible for determining stages at stages in which households attain ownership. Hence, these motivations are critical for analysis in terms of understanding factors affecting tenure. Again, other migration questions are analysed to understand better the assumption suggested by Liang (2013) that rural migrant and young people are more likely to consider rental tenure in urban environment, because they face difficulties in obtaining housing ownership.

2.4 SOCIAL STRUCTURES

There are three dimensions for understanding urban formation and social structures leading to segregation and polarisation: social network, social policy, economic opportunities (Rae, 2008). Ideally, an economic opportunity asserts that regardless of income class, households desire to reside in neighbourhoods closer to their work places or socio-economic activities and places of interest. Pushed to the urban fringes, are the poor, resulting from sharp socio-spatial disparities between the poor and the rich (Rae, 2008). Social welfare policies on the other hand, contradicts the market-orientated principle, because it involves distribution of wealth as an attempt to bridge inequality gaps between the wealthy and the poor. The low-income earners find it difficult to acquire social housing based on affordability-associated problems (Phago, 2010).

People prefer neighbourhoods dominated by their own people in terms of race and citizenship. Social networks are critical in neighbourhood formation considering people's natural herding instincts in their desire for sense of belonging. On the other hand, high-income households would likely cluster together in attempt to derive increasing wealth from common neighbourhood housing, while low-income household would also cluster together for survival instincts. These dimensions associate with locational aspects concerning tenure choice (Shi, 2005). The following aspects influence housing location: site, physical and social environment. However, the choice of neighbourhood also involves

locational trade-offs between the ideal housing location and access to employment, transport, recreation, shopping and schooling of children. Housing in South Africa is achievable through facilitation of the interrelated housing policy in order to provide tenure security, health and safety, and empowerment (Phago, 2010); however this led to displacement of many households ousted to urban peripheries (Gunter, 2011), since most government subsidies, specifically the RDP take place outside the city's inner core.

The type of neighbourhoods some households reside corresponds with their perceived lifestyle and quality of life. Subjectively, even though individual ownership is exempt, social housing promotes quality of life and increases affordability chances to ensure the integration of communities (Phago, 2010). While housing is both financial asset and mechanism to improve the quality of life (Gunter, 2011), other associated factors play critical roles in the determination of affordability. In fact, housing contributes positively to the well-being of the household's life cycle. Thus, levels of income, age group and household size are amongst the important tenure determinants factors. Moreover, Tremblay and Dillman (1983; cited in Shi, 2005) suggests that incomes, education and occupation prestige have direct influence on household preferences. Therefore, the spatial relationships within tenure categories rest in the dynamics associated with deriving wellbeing and stability.

CHAPTER THREE: METHODOLOCAL CONSIDERATIONS

3.1 INTRODUCTION

To explore spatially the determinant variables influencing distribution of housing tenure, a cross sectional analysis in the City of Tshwane Metropolitan Municipality was carried out to analyse the relationship amongst variables in order to derive ownership satisfaction across age groups and to spatially determine areas with increased neighbourhood stability and well-being. The study relied on the available official census spatial datasets sourced from Statistics South Africa. The census income, HH age and population group variables were categorically analysed to establish clusters within the region. This section presents research approach and variables considered for the analysis, data acquisition and analysis thereof.

3.2 RESEARCH APPROACH

The nature of this study is quantitative underpinned by positivist philosophy. A positivist methodological approach is a scientific approach dominated by geographic thinking that embraces spatial analysis and modeling of relationships between characteristics and human behaviour in order to quantify results at local levels over time (Michael, 2006). It is statistically observable than subjective because analysis can be quantitatively described (Levin 1998) and conclusion is based on the rejection and acceptance of the null hypothesis. Thus, positivism is more useful to concentrate on facts and truths – real, empirically observable phenomena and their interrelationships – than on the imaginary, the speculative, the undecided, the imprecise (Comte, 1798–1857; Unwin, 1992; cited in Kitchin, 2006).

Based on the notion that people feel satisfied and have a sense of well-being if they achieve their goals which they have set for themselves centered on the resources available to them, Marans (2011) described two basic approaches associated to quality of life applicable for the study: objective and subjective. The objective approach entails analysis through sets of indicators derived over time from aggregated spatial datasets such as official censuses. The variables associated with this approach include households' income, age group, population group, household type, employment, tenure types, education and household size. The subjective approach involves modeling spatial relationships amongst the derived indicative variables and measure of household's subjective assessment of neighbourhood well-being and stability. However, there are two broad paradigms applied to these approaches depending on the hypothesis constructed and these are qualitative and quantitative techniques. Qualitative technique are mostly concerned with '*understanding human behaviour*', while quantitative methods derive "facts and social phenomena (winter, 2000; Rafferty, 2016. p11). Consequently, the study adopted both objective and subjective approaches in order to analyse tenure and the stages in which households consider ownership as a matter of improving their livelihoods. However the available datasets sourced to supports this adoption are simply limited

in terms of variables relating to human behaviour and therefore modeling satisfaction of housing ownership cannot fully be realised, but rather the subjective interpretation of the findings seem more viable considering the socio-demographic and economic characteristics that influenced tenure distribution.

3.3 UNITS OF ANALYSIS

The methodology applied in this study commenced with the selection of the study area, i.e. City of Tshwane metropolitan municipality in the Gauteng province. The study area selection was purposive with considerations of its unique characteristics in terms of population groups and socio-economic dynamics. It is important to note the study area is an administrative and capital city of the country. Thus, different population and age groups with varying income classes may lodge therein. The study area boundary was then used to select spatial and non-spatial information or attributes critical for analysis. There was no further sampling of units within the study area needed, since all datasets analysed were secondary in nature and covered the entire population within the selected region. Analyses conducted at a sub-place level were to ascertain which neighbourhoods had increased neighbourhood stability and well-being than others. This entailed facts that analysis conducted at low level would yield regional variability by virtue of taking into account the heterogeneity of settlement patterns within the study area.

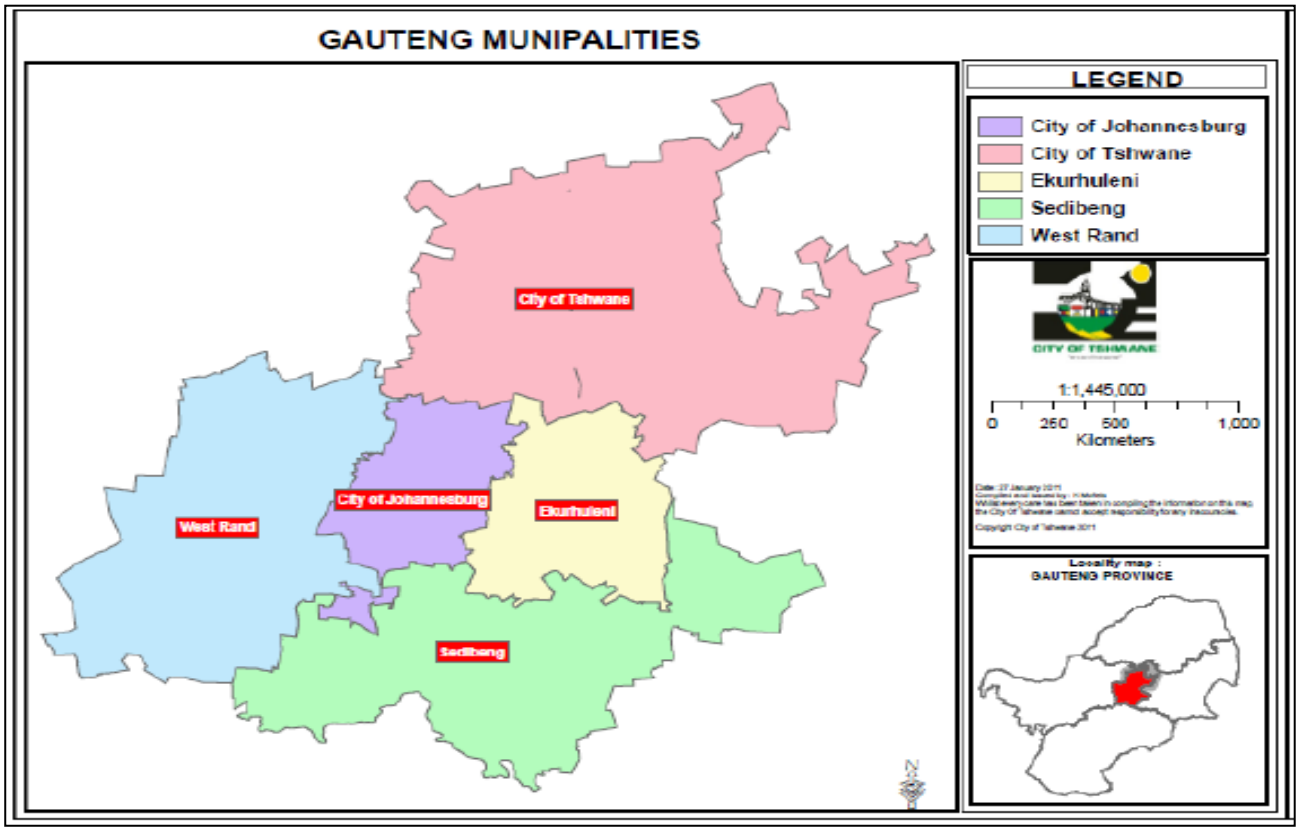

Figure 2: City of Tshwane Metropolitan Municipality (Source: Tshwane MSDF)

3.4 DATA ACQUISITION

The type of education people have; their age, ethnicity and marital status as well as population growth are expected to consume varying housing characteristics (Ma, 2012), resulting in pockets of homogenous neighbourhoods with similar characters. The impact of housing composition (i.e. nuclear family, single person household or extended family) is not exempt; hence, people through various life cycle stages require different housing environments (Shi, 2005). Based on this fact, housing provides a sense of belonging (Gunter, 2011), and the ability to create wealth and security. Tenure is a dependant variable and divided into four categories: "*Owned and fully paid off*", "*Owned but not yet fully paid off*", "*rented*", and "*occupied rent-free"*. The type of employment sector contributes either positive or negative towards housing ownership. This is with consideration that those households engaged in the informal sector may struggle to secure funding for housing due to unstable income. Therefore ownership in particular is used a proxy measure of stable life and sense of wellbeing. Table 1 shows the important socio-demographic and economic characteristics sourced from censuses 2001 and 2011.

	Area of Analysis	**Sub place**	
Variables	**Categories**	**2011**	**2001**
DEMOGRAPHICS	Sex	✓	✓
	Age group	✓	✓
	Household Head age group	✓	X
	Marital Status	✓	
	Population group	✓	X
MIGRATION	Living in this place at the last census	✓	✓
EMPLOYMENT	Sector	✓	X
	Employment	✓	✓
INCOME AND SOCIAL GRANTS	House hold income	✓	✓
FERTILITY	Total children surviving	✓	✓
DWELLING UNIT/TYPE OF DWELLING	Type of Dwelling	✓	✓
DWELLING UNIT/TYPE OF DWELLING	Household type	✓	✓
	Household size	✓	✓
	Tenure Status	✓	✓
EDUCATION	Education level	✓	✓

Table 1: Socio-demographic and economic variables

Income, on the other hand, denotes the total household income used as a proxy measure for affordability. Income in this study is categorised into five groups: no-income, low-income, lower middle-income, upper middle-income and high-income (see table 2). The study has also resorted to establish the number of years the household has been in the study area in order to ascertain whether it was matter of affordability or matter of reluctance why some household had not yet considered ownership over *"rented"* tenure status.

Income groups	Categories
High-Income	R 1228801 - or more
Upper Middle-income	R 307201 - 1228800
Lower Middle-income	R 76801 - 307200
Low-income	R 1 - R 76800
No income	No income

Table 2: Income categories and groupings

3.5 DATA ANALYSIS

The study applied bivariate correlation and geographic weighted regression analysis in order to ascertain stages in which households attained owned tenure in relation to socio-demographic and economic variables. All these analyses conducted entailed both statistics and spatial statistics embedded using ArcGIS and SPSS platforms. Bivariate correlation analysed empirical relationship amongst variables. Unfortunately, correlation analysis did not indicate relationship strength amongst variables and did not yield results regarding the homogenous groupings of ownership in terms of the hypothesis of the study because it lacked spatial weights and connotations. Hence, a geographic weighted regression analysis employed was to model the spatial varying relationships within the study area. Thus, having established the stages at which owned tenure was particularly larger in proportions, it would then be necessary to establish specific areas where such tenure was dominant based on the explanatory variables identified by the bivariate correlation analysis. This enabled determination of distributional patterns through Ordinary Least Square (OLS) in order to determined homogenous groupings and to explore variability of tenure in terms of its randomness, cluster or disperse.

3.6 LIMITATION

Unfortunately, there are limitations observed from the sourced datasets: the absence of reliable rents payable towards bonds or ownership, such information would establish and quantify comparison between *"rented"* and ownership costs. The 2011 and 2001 censuses did not capture the tittle deed variable; hence, it was difficult to quantify the nature of ownership observed in the former township, considering that they were low-income dominated areas. Although the CS 2016 did contain such variable, the results were publishable at municipal level due to statistical significance of the survey sample. Thus, it was irrelevant to use in this study since analysis was purported to be at a local level. This then quantified the reason that led to the use of 2011 and 2001 census data on the basis that they were obtainable at sub-place level. The 2001 census data was however, used to a limited extent just to establish tenure and demographic transition across the study area. Reason regarding the limited use of the 2001 census dataset entails changing sub-place geographical boundaries (i.e. between 2001 and 2011). Differences in sub-place boundaries would distort the spatial distribution of variables analysed, therefore it would defeat the purpose to compare spatial distribution of tenure

between the two terms. Moreover, the 2001 dataset lacked HH age groups, which comprise different household head age groups of individuals legible for work in the employment sector or business.

CHAPTER FOUR: EMPIRICAL ANALYSIS

4.1 BACKGROUND

According to the census 2011 tenure was, divided into five categories: "*owned but not yet paid off*", "*owned and fully paid off*", *"rented",* "*occupied and rent free*" and "*tenure other".* The integral focus of the study was on owned tenure. Moreover, it is important to note that owned tenure is broken down into two categories, which are "*owned but not yet paid off*" and "*owned and fully paid off*". Hence, these categories were analysed together against socio-demographic and economic factors to determine life cycle stages in which households attain ownership. Therefore, having established such stages, analysis of tenure between 2011 and 2001 was to establish variability and spatial distributional patterns of owned tenure. Grounded on such objective, the study hypothesis of the study was that owned tenure is larger on average for people between the ages of 35 and 49 across the entire study area. In white population groups, owned tenure is higher between the "*HH ages of 20 - 34*" as opposed to other population groups where owned tenure was lowest at this age group. Moreover, homogenous groupings of tenure cluster in specific areas within the study area based on socio-demographic and economic factors.

In the nutshell, tenure is an influenced variable, while socio-demographic and economic variables are independent or exploratory variables. There are two independent groups identified in order to establish relationships based on socio-economic and demographic variables. First independent group involved population group, income class, HH age group and by extension EA types. The second independent group, however, entailed social variables pertaining to the characteristics of households that included household type, dwelling types, headship, higher education, marital status, household size, number of children surviving and migration. As tenure was in 2011 influenced in varying degrees by diverse variables other than income, the correlation analysis and geographical weighted regression employed were to explore the HH age group engaged in owned tenure. The results presented on presented on 4.2 are for bivariate correlation analysis, and those for geographical weighted regression on 4.3. Since some settlement patterns reflected some social and economic inequalities, there was a need to conduct Ordinary Least squares (OLS) on 4.4 in order to insinuate and categorically quantify that the study area was a heterogeneous type with homogenous groupings in specific areas.

4.2 CORRELATION

According to the bivariate correlation conducted using the census 2011, the estimates on table 3 have revealed a strong positive correlation (0.507**) between "*HH age group 20-34*" and "*rented*" tenure, while a weak positive correlation was observed with population groups, income class and EA types. In this study, a week correlation refers to 0.0 - 0.4 while strong relationship is 0.5 – 1.0. The relationship can turn either negative or positive. Therefore, most people at "*HH age group 20 – 34*"

who were engaged on the rental tenure had zero children surviving (0.487**) and they did not necessarily originate from the region (0.363**) while on the other hand, they were characterised by single person household (0.315**) and a household size of one (0.322**), where a person lives alone (0.298**). The lower middle-income (0.173**) and upper middle-income (0.180**) are also amongst the explanations for such involvement in the rental tenure, meaning that people at such HH age group simply did not engage in ownership due to affordability and reasons related to migration factors. Hence, these people have probably left their families in places of origin or they were simply not yet married. This explains why such households had zero children surviving. On the contrary, even though the correlation between "*Owned but not yet paid off*" tenure and "HH age group 35 – 49" is of weak (0.400**), the significance of such tenure cannot be overlooked. Thus, even when it is not fully paid-up, ownership provides autonomy, sense of wellbeing and stability of households.

Pearson Correlations (Sig. (2-tailed) and Number of sub-places = 654)						
Variables		**Rented**	**Owned but not yet paid off**	**Occupied rent-free**	**Owned and fully paid off**	**Tenure Other**
Household Head Age Group	HH age 10 - 19	.135**	-.232**	.211**	-0,021	0,040
	HH age 20 - 34	**.507****	-.187**	.261**	-.295**	0,000
	HH age 35 - 49	-0,071	.400**	0,059	0,015	.114**
	HH age 50 - 64	-.191**	.118**	-.132**	.386**	-0,005
	HH age 65 +	-.085*	-0,050	-.149**	.373**	0,000
Population Group	Black African	-0,064	-.366**	.268**	.401**	0,069
	Coloured	.125**	0,053	-0,075	-0,053	-0,022
	Indian or Asian	0,042	0,058	-.097*	-0,050	0,032
	White	.157**	.477**	-.174**	-.296**	-0,032
	Pop group Other	.229**	0,071	-.081*	-.143**	0,046
Income Class	No-income	.120**	-.408**	.216**	.202**	0,076
	Low-income	-.152**	-.592**	.471**	.418**	.152**
	Lower middle-income	.173**	-.324**	.217**	.170**	0,035
	Upper middle-income	.180**	**.750****	-.433**	-.306**	-.130**
	High-income	0,012	**.634****	-.286**	-.237**	-0,020
Types Enumeration Areas	Collective living quarters	.358**	-.158**	-0,035	-.180**	.163**
	Commercial	.097*	-.100*	0,052	-.127**	.119**
	Formal residential	0,051	.459**	-.536**	.278**	-.177**
	Industrial	0,045	-0,070	.183**	-.166**	0,036
	Informal residential	-.109**	-.202**	.241**	.094*	.102**
	Parks and recreation	-.087*	-.149**	.404**	-.164**	0,018
	Small Holdings	0,056	-.115**	.323**	-.202**	0,072
	Traditional residential	-.174**	-.142**	0,020	.307**	0,002
	Vacant	-0,051	-0,051	0,029	-0,049	0,018
**. Correlation is significant at the 0.05 level (2-tailed).*						
***. Correlation is significant at the 0.01 level (2-tailed).*						
c. Cannot be computed because at least one of the variables is constant.						

Table 3: Correlation showing tenure relationship with first independent variables

Pearson Correlations (Sig. (2-tailed) and Number of sub-places = 654)						
Variables		**Rented**	**Owned but not yet paid off**	**Occupied rent-free**	**Owned and fully paid off**	**Tenure Other**
Migration	Born after October	-.208**	-.153**	0,040	**.610****	0,017
	Born after October 200	.087*	.384**	0,064	-.343**	.105**
	Living in - Yes	-.148**	-.139**	-0,035	**.566****	-.087*
	Living in – No	.363**	.242**	.111**	-.506**	.130**
Types of Dwellings	Formal Dwellings	.084*	**.531****	-.445**	.167**	-.119**
	Traditional Dwellings	-0,071	-0,057	.194**	-0,026	0,013
	Informal Dwellings	-.156**	-.418**	**.575****	.090*	0,033
	Other Dwellings	.249**	-.216**	0,060	-.242**	.220**
Types of Households	Single person	.315**	-.324**	.443**	-.338**	.154**
	Nuclear family	-0,026	**.658****	-.196**	0,008	0,006
	Extended family	-.205**	-0,060	-.198**	**.691****	-.098*
	Other types of family	.228**	-.288**	0,062	.151**	-0,004
Education	Primary School	-.314**	-.292**	.464**	.467**	.213**
	Secondary School	.193**	-.332**	.275**	.355**	0,071
	No Schooling	-0,071	-.304**	.350**	.168**	.109**
	Higher	.247**	**.659****	-.369**	-.312**	-.080*
Marital Status	Married	.115**	**.559****	-.111**	-.245**	0,001
	Living together like	0,074	-.311**	**.547****	-.101**	.182**
	Never married	.140**	-.226**	.103**	.481**	0,064
	Widower widow	-0,010	.099*	-.133**	.276**	-0,051
	Separated	0,064	-0,058	0,008	.144**	-0,058
	Divorced	.166**	.415**	-.178**	-.152**	-.087*
Total Children Surviving	Surviving Children 0	.487**	.077*	-0,062	-0,068	-0,059
	Surviving Children 2	-.112**	.229**	.127**	.198**	.148**
	Surviving Children 3 +	-.232**	-.107**	.191**	.425**	0,071
Employment	Employed	.285**	.483**	0,057	-.383**	0,023
	Unemployed	-.125**	-.425**	0,037	**.674****	0,043
Headship	Head Couple	-.199**	**.631****	-.304**	.200**	-.083*
	Head without Spouse	0,047	-0,025	-.079*	**.541****	-0,056
	Single Alone	.298**	-.343**	.388**	-.374**	.167**
Household Size	HHsize 1	.322**	-.307**	.424**	-.267**	0,068
	HHsize 2	.284**	.168**	-.077*	-.139**	.169**
	HHsize 3	-0,019	.405**	-.085*	.171**	-0,064
	HHsize 4	-.195**	**.623****	-.275**	.209**	-.087*
	HHsize 5	-.254**	.279**	-.226**	.455**	-.090*
	HHsize 6 +	-.180**	-.190**	-0,064	**.581****	0,004
**. Correlation is significant at the 0.05 level (2-tailed).*						
***. Correlation is significant at the 0.01 level (2-tailed).*						
c. Cannot be computed, because at least one of the variables is constant.						

*Table 4 **:** Correlation showing tenure relationship with second independent variables*

Moreover, there is a strong positive relationship between "*Owned but not yet paid off*" tenure and, the following socio-demographic and economic variables: lower middle-income (0.750**), Upper middle-income (0.634**), Formal Dwellings (0.531**), Nuclear family (0.658**), Higher education (0.659**), Married (0.559**), Head Couple (0.631**) and Household size 4 (0.623**). The prospects

of ownership increased with the presence of children and the increasing household size as well as higher income rates.

Most people involved in the "*Owned but not yet paid off*" tenure resided in the formal EA type (0.459**). It is no surprise that the white population group (0.477**) dominated this tenure as reflected by table 3, because their levels of income was higher when compared to other population groups. Table 5 depicts that the Upper middle-income (0.603**) and High-income (0.664**) have positive correlation with white population group which translates to affordability measures for owned tenure. This confirms the hypothesis that white population group dominated ownership early at "*HH age group 20 - 34*". Thus, these results explained the affordability aspect in terms of income necessary for obtaining ownership.

On the contrary, table 4 depicted that "O*wned and fully paid off*" correlated positively with extended family (0.691**), household size of 6+ (0.581**) and "*household headed without spouse*" (0.541**). The majority of people have been residents for a longer period, as it is evident through migration status that they were born in the region after 2001 and never moved (0.610**), while others have lived in the same region before 2001 (0.566**). However, considering the low-income (0.418**) associated with mostly the ageing society (i.e. "HH age group 50 – 64" and "HH age group 65 +" with weak positive correlations of 0.386** and 0.373** respectively), most of these areas are found at the outskirt of the city and comprised the former homelands and former townships. Hence, these findings reflect impacts caused by RDP programs and historical inherited properties. Again, estimates revealed that most of "O*wned and fully paid off*" tenure was also dominant in the traditional areas (0.307).

Pearson Correlations (Sig. (2-tailed) and Number of sub-places = 654)						
Variables		**No income**	**Low-income**	**Lower middle-income**	**Upper middle-income**	**High-income**
Population Group	Black	.409**	**.617****	.442**	-.513**	-.575**
	Coloured	-0,017	-.080*	0,067	.090*	-0,004
	Indian or	-.092*	-.144**	-.111**	.122**	.144**
	White	-.336**	-.516**	-.332**	**.603****	**.664****
	Other	-0,074	-.153**	-.102**	.176**	.244**
**. Correlation is significant at the 0.05 level (2-tailed).*						
***. Correlation is significant at the 0.01 level (2-tailed).*						
c. Cannot be computed, because at least one of the variables is constant.						

Table 5: Correlation showing population groups and income class

Correlation analysis depicted on figure 3, indicates the life cycle stages in which households attain owned tenure in relation with socio-demographic and economic variables. Although there is higher rental rates at "HH age group 20 – 34", it is apparent that people on average engage largely on "*Owned but not yet paid off*" tenure at their late 30s hoping to attain "*Owned and fully paid off*" tenure towards their retirement years. There was no strong positive correlation observed between "*tenure*

other" with any of the variables. "*Tenure other*" in this regard, is an umbrella term representing special dwelling institutions, collective living quarters and others, which constituted a small margin of the population compared to other types of tenure.

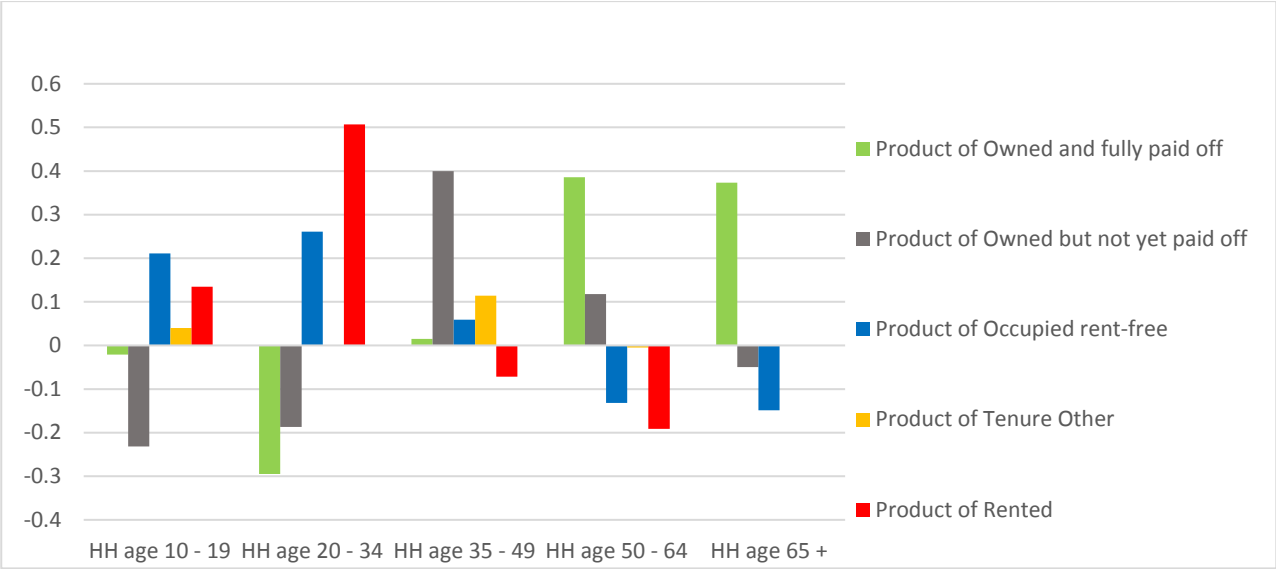

Figure 3: Correlation graph showing relationship between tenure and HH age group

4.3 GEOGRAPHICAL WEIGHTED REGRESSION

Realising that the bivariate correlation analysis did not indicate the strength of relationships amongst variables and their categories, conducting a geographical weighted regression was necessary in order to explore fully the variability of spatial relationship within the study area. Categories of tenure were observed across all ages groups and the adjusted R^2 of 0.30851 on table 6 meant that "*HH age group 35 – 49*" explained about 31% of what occurs on the "*Owned and not yet paid off*" which was a larger proportion at this age group compared to the rest. It is important to portray that "*Owned and fully paid off*" were observed to be larger at "*HH age group 50 – 64*" and highest at "*HH age group 65+*". Thus, regarding the adjusted R^2, "*HH age group 50 – 64"* and "*HH age group 65+"* explained 27.1% and 31.4% respectively of what occurred in the "*Owned and fully paid off*".

	Owned but not yet paid off		Owned and fully paid off		Rented		Occupied rent free		Tenure Other	
HH age group	R Squared	Adjusted R Squared	R Squared	Adjusted R Squared	R Squared	Adjusted R Squared	R Squared	Adjusted R Squared	R Squared	Adjusted R Squared
HH Age 10 - 19	0,183984	0,166176	0,202621	0,18522	0,111432	0,092042	0,189078	0,171382	0,029116	0,007929
HH Age 20 - 34	0,174017	0,158941	0,243946	0,230146	0,260402	0,246902	0,160071	0,14474	0,000202	-0,001336
HH Age 35 - 49	0,325035	0,30851	0,232067	0,213265	0,074683	0,052027	0,079293	0,062296	0,007623	0,006096
HH Age 50 - 64	0,144345	0,127846	0,285436	0,271658	0,087427	0,069831	0,141236	0,124677	0,028741	0,010013
HH Age 65 +	0,103564	0,087412	0,326073	0,313931	0,067487	0,050686	0,09298	0,076638	0,001331	-0,000206

Table 6: Summary of Geographical Weighted regression between HH age group and tenure

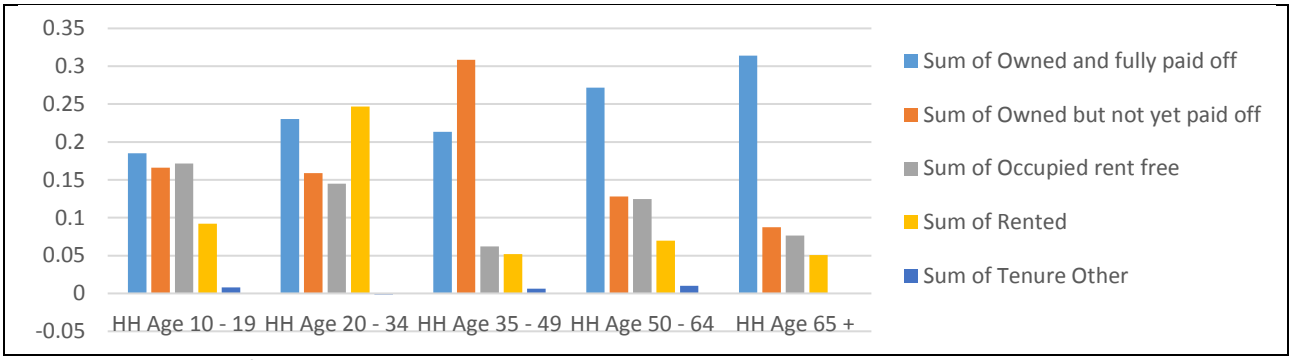

Figure 4: Adjusted R^2 between HH age group and tenure

Figure 4 correspond to the data contained in table 7 depicting that ownership spreads at varying degrees across all "*HH age groups*". However, "*HH age group 35 – 49*" dominates "*Owned and not yet paid off*" while "*Owned and fully paid off*" tenure was dominated by "*HH age group 50 – 64"* and "*HH age group 65+".* The estimates also revealed inconsistences with "*HH age group 10 – 19*" which is practically impossible to have children engage in certain aspects of ownership, unless such resulted from inheritance or households headed by young adults in the absence of parent during the 2011 enumeration period.

Population groups	Owned but not yet paid off		Owned and fully paid off	
	HH Age group	HH Age group 35 -	HH Age group 20 - 34	HH Age group
Black African	0,247558	0,460192	0,35788	0,275314
Coloured	0,166877	0,294914	0,241259	0,193682
Indian or Asian	0,163828	0,295495	0,245224	0,199175
White	0,342924	0,456598	0,315931	0,254543
Adjusted R Squared				
Dependent variable = Owned but not yet paid off or Owned and fully paid off				
Explanatory variables = HH Age group 20 - 34, HH Age group 35 – 49 and Population groups				

Table 7: Geographical Weighted regression per population group against HH age groups and tenure

Population	HH Age group	HH Age
Black African	0,590262	0,448104
Coloured	0,052516	0,02832
Indian or	0,095062	0,062391
White	0,601114	0,568752
Dependent variable = Population group		
Explanatory variables = HH Age group 20 - 34,		

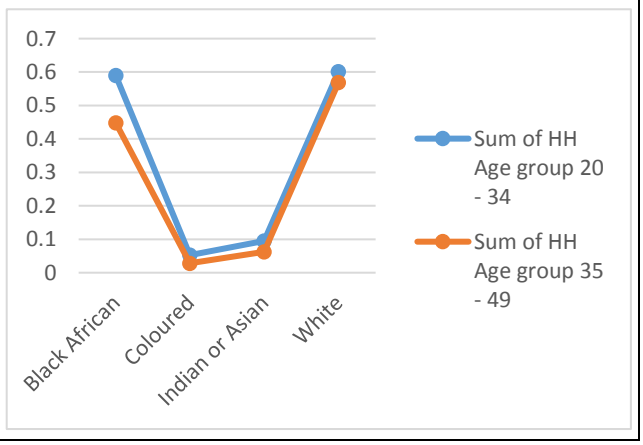

Table 8: Geographical Weighted regression per population group against HH age groups and income class

The results observed between GWR and correlation analysis arrived at the same conclusion except that GWR further explored owned tenure against population and HH age groups in order to conclude that ownership was higher in the white population group than the rest. Table 7 illustrates that white population group at "*HH age group 20 – 34*" with an adjusted R^2 of 0.342924, dominated the "*Owned*

and not yet paid off" tenure. This is because income shown on table 8 was higher for the white population group with adjusted R^2 of 0,601114, compared to other groups. Although there was delayed ownership at the "*HH age group 20 – 34*" due to low-income by other population groups, the Black African population at "*HH age group 35+*" became largely dominant on both "*Owned and not yet paid off*" and "*Owned and fully paid off*" tenure. It seems that majority of people at "*HH age group 20 – 34*" earned higher incomes compared to those at "*HH age group 35 – 49*". Therefore, income was not necessarily the sole determinant factor, but there were other factors involved.

4.4 DISTRIBUTIONAL PATTERNS OF TENURE

Some regions have stabilised and did not have much housing developmental activities taking place; hence, the type of tenure groupings differed. The second objective of this study was to explore spatial variability and distributional patterns of owned tenure in relation to socio-demographic and economic variables. Hence, assumed that the distributional pattern of owned tenure across different age and population groups were observable in homogenous groupings within the study area. Therefore, ordinary least squares (OLS) employed.

4.4.1 ORDINARY LEAST SQUARES

This section present regression results performed on the Ordinary Least Squares (OLS) using variables estimated by the bivariate correlation analysis. The following were estimated as explanatory variables which had positive correlations with *"Owned but not yet paid off"* tenure: higher education, upper middle-income, high-income, formal dwelling type, household size, nuclear family household, married, head couple, Household size 4. However, the "*HH age group 50 - 64*", "*HH age group 64+",* Born after October 2001 and never moved, Living in (Yes) , Extended family, Unemployed, Head without Spouse, and Household size 6 correlated for positively with *"Owned and fully paid off".*

4.4.1.1 Owned but not yet paid off

Depicted on table 9 and 10, is OLS Diagnostics Summary of Results. An Adjusted R^2 value of 0.716384 explained approximately 72% of the variation in the dependent variable. This meant that the explanatory variables influenced about 72% of *"Owned but not yet paid off"* and the nature of such relationship is strong and positive. There is no statistical significance observed between "*HH age group 35 - 49*" and *"Owned but not yet paid off*", however the "*HH age group 35 - 49*" was not redundant for the model, because it was less than 7.5 of the VIF (c). Additionally, higher education variable could not be part of the model because it exceeded a VIF (c) of 7.5, meaning it was not necessary to be included amongst the explanatory variables.

Although Histogram of Standardized Residuals shown on figure 5, looks different from a normal curve and biased based on the Jarque-Bera statistics, the diagonals on figure 6 indicated a positive

directional distribution of such tenure. Thus, the distribution patterns of *"Owned but not yet paid off*" is not normal across the study area, but some clusters were observable on varying degrees.

Input Features:	SUBPLACE2011VARIABLE201	Dependent Variable:	OWNED_BUT_NOT_YET_PAID_
Number of Observations:	654	Akaike's Information Criterion (AICc) [d]:	5037,188966
Multiple R-Squared [d]:	0,719859	Adjusted R-Squared [d]:	0,716384
Joint F-Statistic [e]:	207,176370	Prob(>F), (8,645) degrees of freedom:	0,000000*
Joint Wald Statistic [e]:	1871,828362	Prob(>chi-squared), (8) degrees of freedom:	0,000000*
Koenker (BP) Statistic [f]:	67,980134	Prob(>chi-squared), (8) degrees of freedom:	0,000000*
Jarque-Bera Statistic [g]:	2720,906454	Prob(>chi-squared), (2) degrees of freedom:	0,000000*

Table 9: "Owned but not yet paid off" OLS Diagnostics

Variable	Coefficient [a]	StdError	t-Statistic	Probability [b]	Robust_SE	Robust_t	Robust_Pr [b]	VIF [c]
Intercept	-10,178543	1,913925	-5,318150	0,000000*	2,181010	-4,666894	0,000005*	--------
FORMAL_DWELL	-0,005561	0,020206	-0,275220	0,783242	0,024601	-0,226053	0,821232	1,754625
NUCLEAR_FAMI	-0,148931	0,056015	-2,658790	0,008032*	0,097164	-1,532790	0,125832	4,012057
CLASSUPERMID	0,532842	0,035046	15,204185	0,000000*	0,066770	7,980260	0,000000*	2,125496
CLASSHIGHINC	0,386260	0,049033	7,877536	0,000000*	0,058381	6,616212	0,000000*	2,052304
F35___49_HEA	0,040919	0,050405	0,811802	0,417193	0,084618	0,483570	0,628867	1,981058
F_MARRIEDA	0,114642	0,048817	2,348412	0,019140*	0,067622	1,695345	0,090502	2,192018
HEADCOUPLE	0,438558	0,066873	6,558048	0,000000*	0,127374	3,443066	0,000627*	3,876817
HHSIZE_4	0,424478	0,134062	3,166285	0,001630*	0,228307	1,859244	0,063448	3,954893

Table 10: "Owned but not yet paid off" Summary of OLS Results - Model Variables

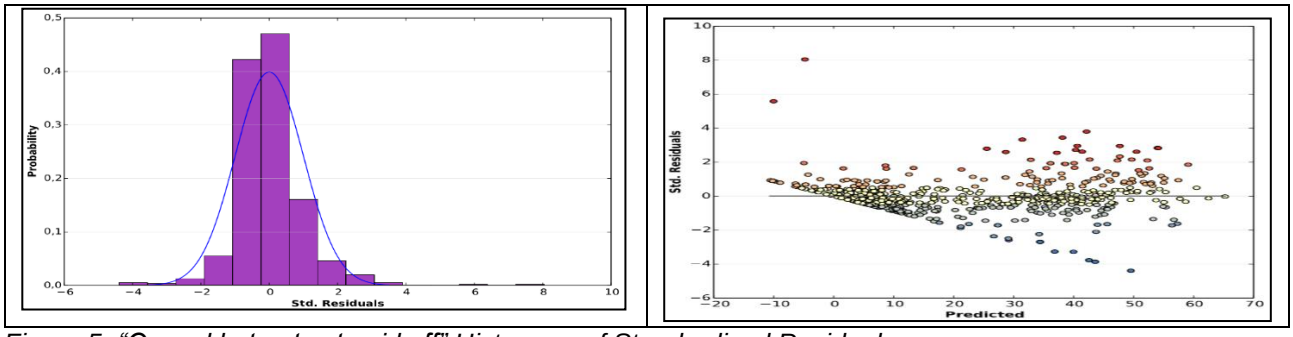

Figure 5: "Owned but not yet paid off" Histogram of Standardized Residuals

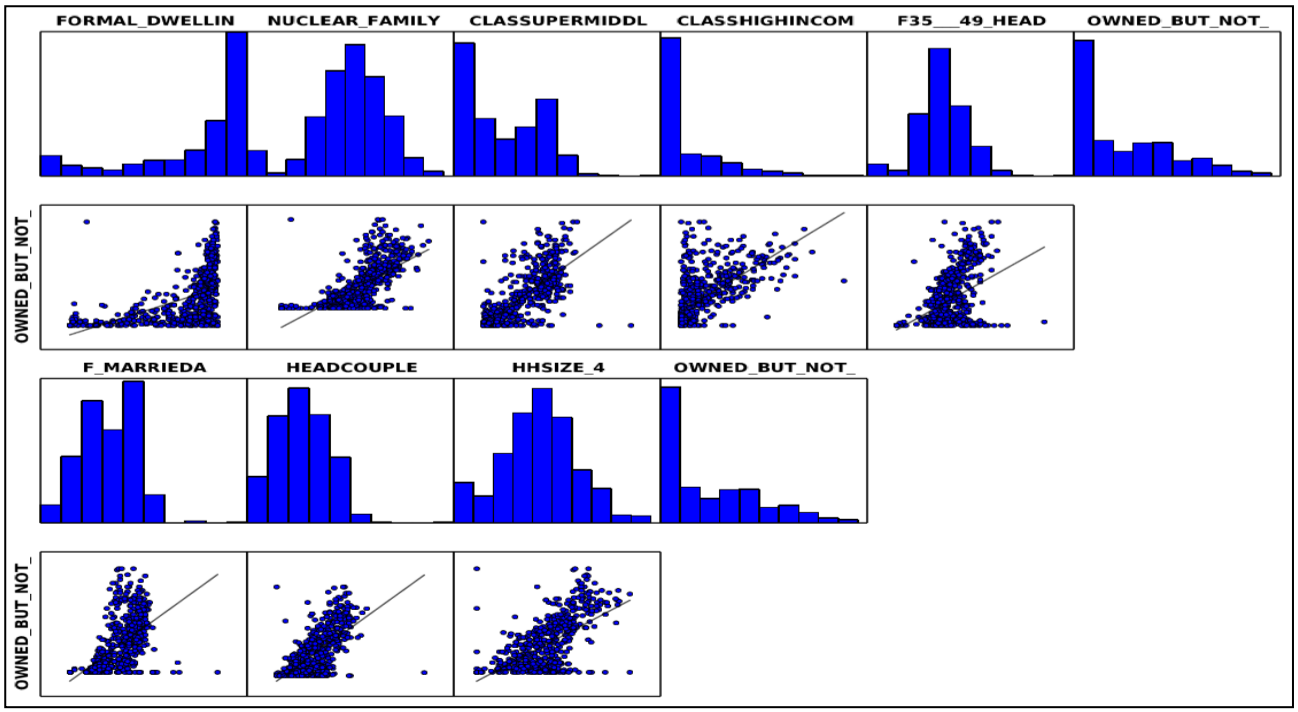

Figure 6: "Owned but not yet paid off" Variable Distributions and Relationships

4.4.1.2 Owned and fully paid off

Depicted on table 11, is an Adjusted R^2 value of 0.647366 explaining approximately 65% of the variation in the dependent variable. This meant that the explanatory variables influenced about 65% of what occurred in the *"Owned and fully paid off"* category and the nature of such relationship was strong and positive. Although the Histogram of Standardized Residuals looked different from a normal curve and biased based on the Jarque-Bera statistics, the diagonals indicated a positive directional distribution of such tenure. The model also estimated a statistically significant relationship between "Owned and fully paid off" and "*HH age group 50+*".

Input Features:	SUBPLACE2011VARIABLE201	Dependent Variable:	OWNED_AND_FULLY_PAID_OF
Number of Observations:	654	Akaike's Information Criterion (AICc) [d]:	5244,392048
Multiple R-Squared [d]:	0,651687	Adjusted R-Squared [d]:	0,647366
Joint F-Statistic [e]:	150,847599	Prob(>F), (8,645) degrees of freedom:	0,000000*
Joint Wald Statistic [e]:	1045,063351	Prob(>chi-squared), (8) degrees of freedom:	0,000000*
Koenker (BP) Statistic [f]:	59,569203	Prob(>chi-squared), (8) degrees of freedom:	0,000000*
Jarque-Bera Statistic [g]:	596,643373	Prob(>chi-squared), (2) degrees of freedom:	0,000000*

Table 11: Owned and fully paid off OLS Diagnostics

Variable	Coefficient [a]	StdError	t-Statistic	Probability [b]	Robust_SE	Robust_t	Robust_Pr [b]	VIF [c]
Intercept	-13,516793	2,325862	-5,811519	0,000000*	2,503968	-5,398149	0,000000*	--------
BORN_AFTER_O	0,661560	0,186365	3,549807	0,000427*	0,224074	2,952419	0,003276*	4,042358
LIVING_IN_YE	-0,128616	0,044179	-2,911243	0,003731*	0,053515	-2,403355	0,016513*	3,296337
EXTENDED_FAM	0,225516	0,110025	2,049677	0,040790*	0,129199	1,745499	0,081381	5,318570
F50___64_HEA	0,440567	0,069270	6,360145	0,000000*	0,087267	5,048489	0,000001*	2,246201
F65___HEAD	0,728691	0,080867	9,011037	0,000000*	0,094355	7,722894	0,000000*	1,735737
UNEMPLOYED_	0,554922	0,049789	11,145443	0,000000*	0,079403	6,988702	0,000000*	2,701735
HEAD_WITHOUT	0,104625	0,064464	1,622987	0,105093	0,081321	1,286557	0,198717	2,087213
HHSIZE_6_ABO	0,192642	0,112774	1,708214	0,088087	0,116537	1,653063	0,098816	2,934866

Table 12: Owned and fully paid off Summary of OLS Results - Model Variables

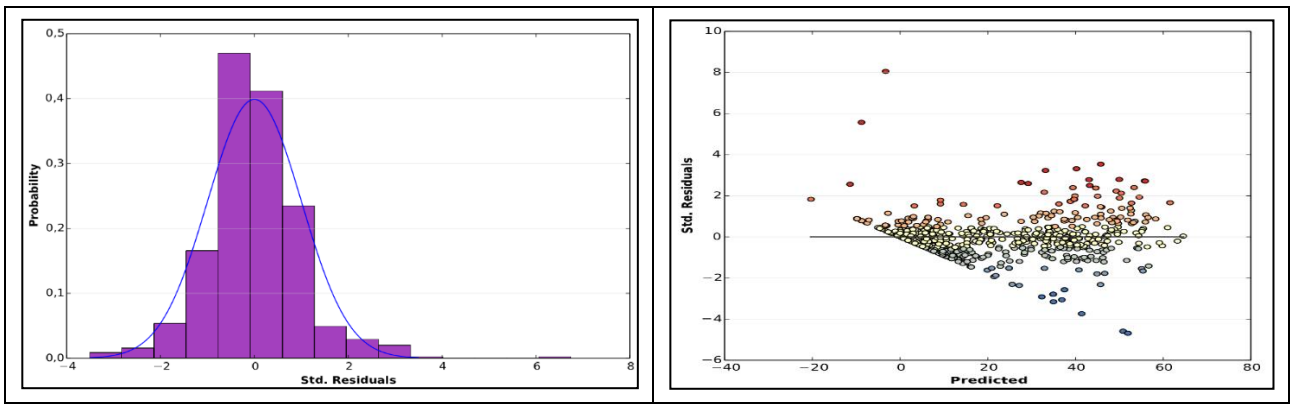

Figure 7: Owned and fully paid off Histogram of Standardized Residuals

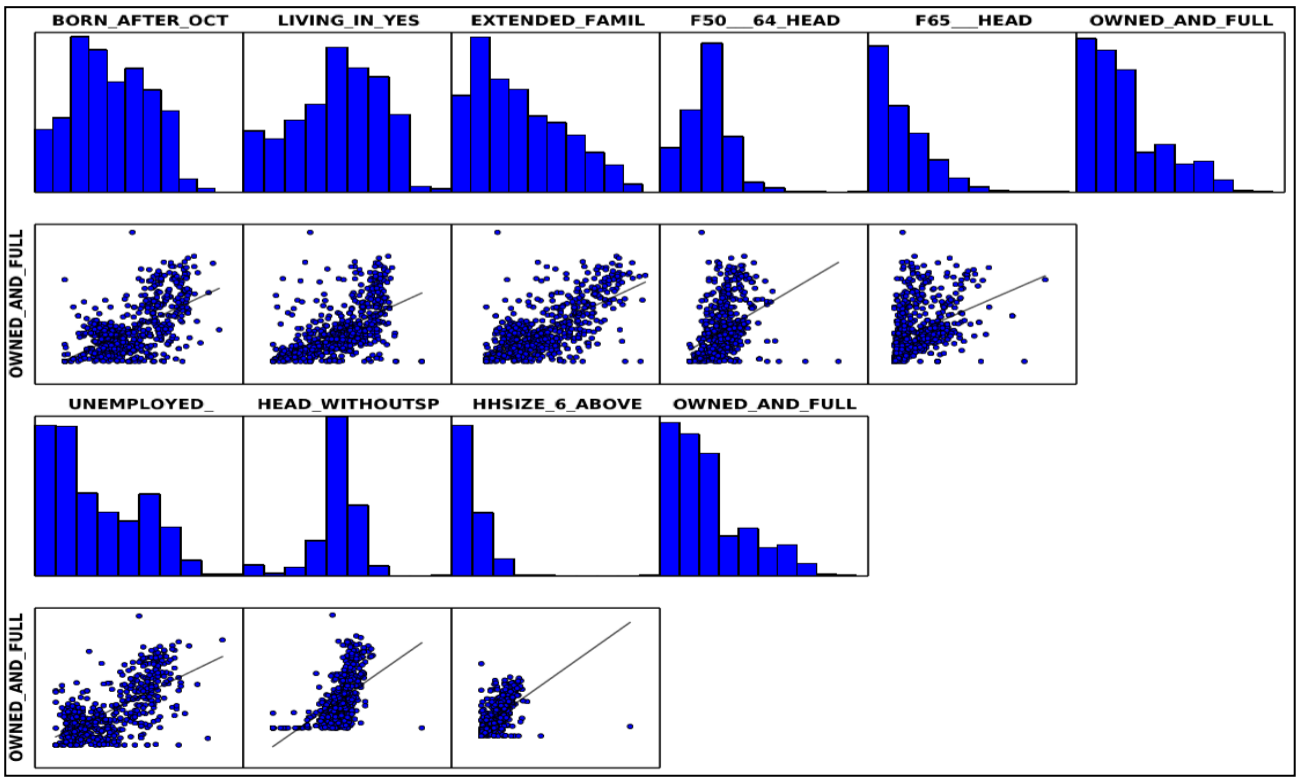

Figure 8: Owned and fully paid off Variable Distributions and Relationships

4.4.1.3 "Rented" and "Occupied rent-free"

The rented and occupied rent-free were not necessarily the focus of the study, however, it was crucial to also analyse these categories in order to ensure evenness in terms of tenure distributional patterns within the study area. Explanatory variables explained about 26% and 39% of what occurred on the rented and occupied rent-free respectively (refer to table 13). The nature of relationship depicted on figure 9, indicates a positive directional distribution of such tenure categories. Like the two categories of ownership, the rented and occupied rent-free tenures clustered in specific areas within the study area.

Input Features:	SUBPLACE2011VARIABLE201	Dependent Variable:	OCCUPIED_RENT_FREEA
Number of Observations:	654	Akaike's Information Criterion (AICc) [d]:	5458,641461
Multiple R-Squared [d]:	0,392353	Adjusted R-Squared [d]:	0,389549
Joint F-Statistic [e]:	139,900068	Prob(>F), (3,650) degrees of freedom:	0,000000*
Joint Wald Statistic [e]:	175,687695	Prob(>chi-squared), (3) degrees of freedom:	0,000000*
Koenker (BP) Statistic [f]:	87,368144	Prob(>chi-squared), (3) degrees of freedom:	0,000000*
Jarque-Bera Statistic [g]:	505,703926	Prob(>chi-squared), (2) degrees of freedom:	0,000000*

Input Features:	SUBPLACE2011VARIABLE201	Dependent Variable:	RENTEDA
Number of Observations:	654	Akaike's Information Criterion (AICc) [d]:	5665,897713
Multiple R-Squared [d]:	0,256759	Adjusted R-Squared [d]:	0,255619
Joint F-Statistic [e]:	225,238433	Prob(>F), (1,652) degrees of freedom:	0,000000*
Joint Wald Statistic [e]:	166,305102	Prob(>chi-squared), (1) degrees of freedom:	0,000000*
Koenker (BP) Statistic [f]:	51,279890	Prob(>chi-squared), (1) degrees of freedom:	0,000000*
Jarque-Bera Statistic [g]:	59,434269	Prob(>chi-squared), (2) degrees of freedom:	0,000000*

Table 13: Occupied rent-free and rented tenure Summary of OLS Diagnostics

Occupied rent-free

Variable	Coefficient [a]	StdError	t-Statistic	Probability [b]	Robust_SE	Robust_t	Robust_Pr [b]	VIF [c]
Intercept	3,068981	1,373565	2,234318	0,025786*	1,203145	2,550799	0,010967*	--------
INFORMAL_DWE	0,344047	0,034707	9,913024	0,000000*	0,062215	5,529970	0,000000*	1,609690
F20___34_HEA	-0,066114	0,050264	-1,315339	0,188868	0,065095	-1,015652	0,310162	1,409114
F_LIVING_TOG	1,278216	0,165383	7,728814	0,000000*	0,326662	3,912963	0,000110*	2,018724

Rented tenure

Variable	Coefficient [a]	StdError	t-Statistic	Probability [b]	Robust_SE	Robust_t	Robust_Pr [b]
Intercept	8,278404	1,575339	5,254997	0,000000*	1,472193	5,623179	0,000000*
F20___34_HEA	0,745758	0,049691	15,007946	0,000000*	0,057829	12,895934	0,000000*

Table 14: Occupied rent-free and rented tenure Summary of OLS Results - Model Variables

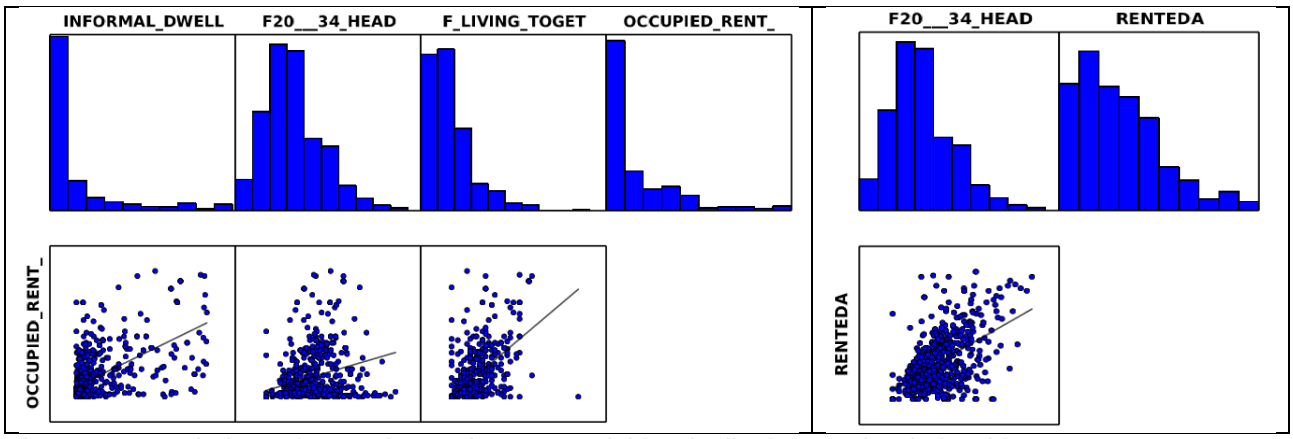

Figure 9: Occupied rent-free and rented tenure Variable Distributions and Relationships

4.4.2 DISTRIBUTIONAL PATTERNS DISCUSSION

Figures 10 presents OLS results and estimated homogenous groupings of owned tenure across the study area. Estimates revealed that "*Owned and fully paid off*" tenure dominated the North West parts and such tenure was larger in region 1 and 2 due to the presence of former township areas which were Black African dominated with very low income to no-income classes. Gunter (2011) and Rafferty (2016) alluded that the low-income migrants or households locate in the urban fringes because property rents are lower in the townships. Hence, state-subsidies of housing located most of this population group at urban peripheries. In light of being low-income dominated areas as well as prominence of unemployment probably due to ageing community, the high black "*Owned and fully paid off*" category is a product of RDP programs and historical inherited properties from the former homelands beneficiaries. Senior citizens dominate this tenure category remarkably. Thus, their duration of stay in these locations pre-dates the census 2001.

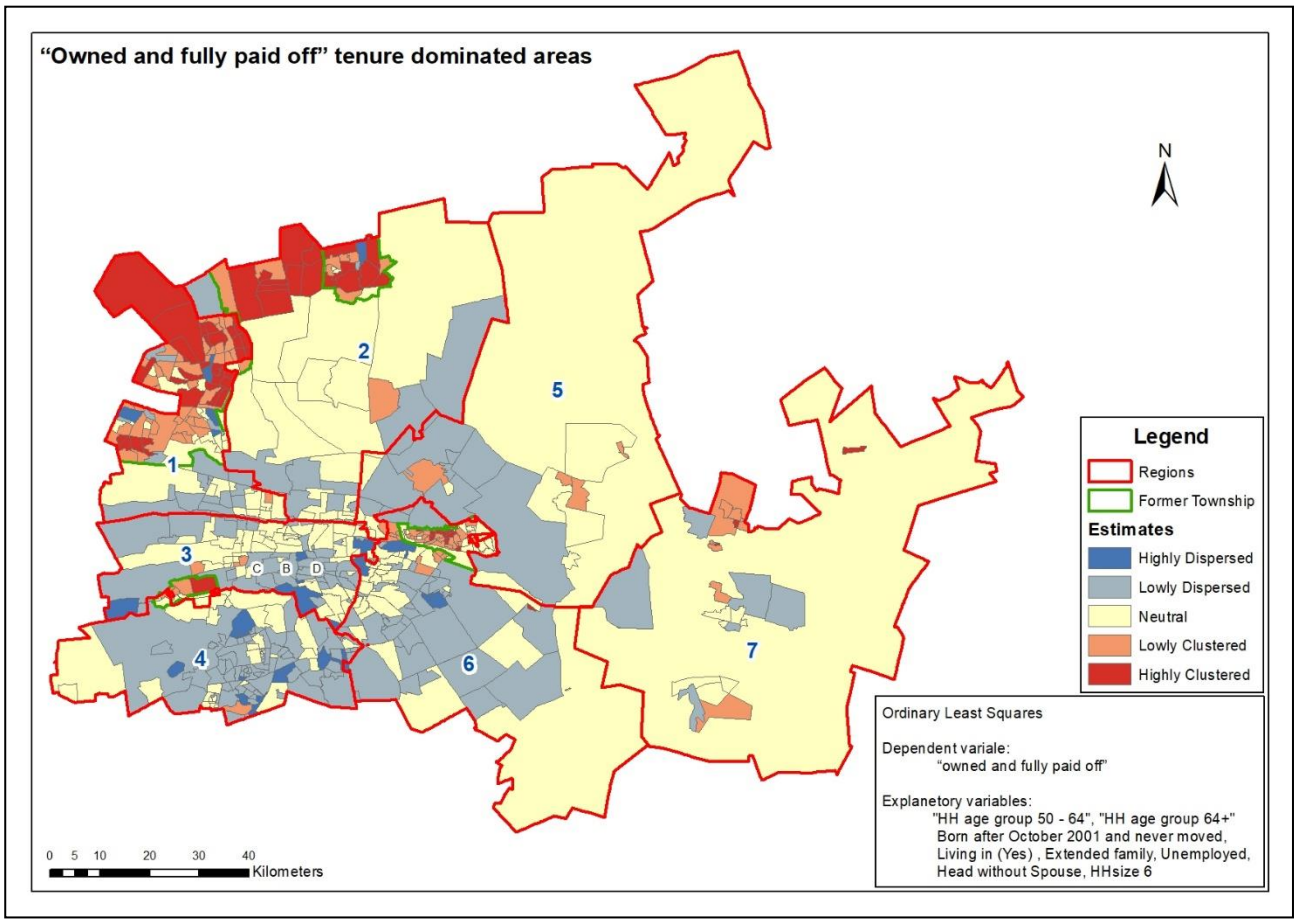

Figure 10: OLS on "Owned and fully paid off" tenure dominated areas

The social mobility aspect is that young people relocate into suburbs either within the city or without, leading to higher population of senior citizens in rural areas (Ellsaesser, 2002). The presence of young adults who were born after 2001 and never moved suggest inheritance of historical properties, while extended families and larger household size concur with the type of ownership that is fully paid off. Nevertheless, this type of tenure is mostly attainable because property rents are low and people

who obtained them were able to payoff quicker compared to areas where land prices were volatile and high.

On the contrary, estimates revealed that the study area was rather heterogeneous in nature with pockets of homogeneous groupings. Thus, the "*Owned and not yet paid off*" tenure achievable at the "*HH age group 35 – 49*" was not constant across different areas of the study. Hence, depicted on figure 11 is a map showing "*Owned but not yet paid off*" tenure dominated areas. Concentration of this tenure was highly clustered in specific parts of region 1, 4, and 6. These regions were the fastest growing areas that attracted larger proportions "*HH age group 35 – 49*". The high land value is associated with upper middle to high-incomes in affordability terms, while household engaged in this tenure were characterised by nuclear family, headed by married couples and a household size of at least four members.

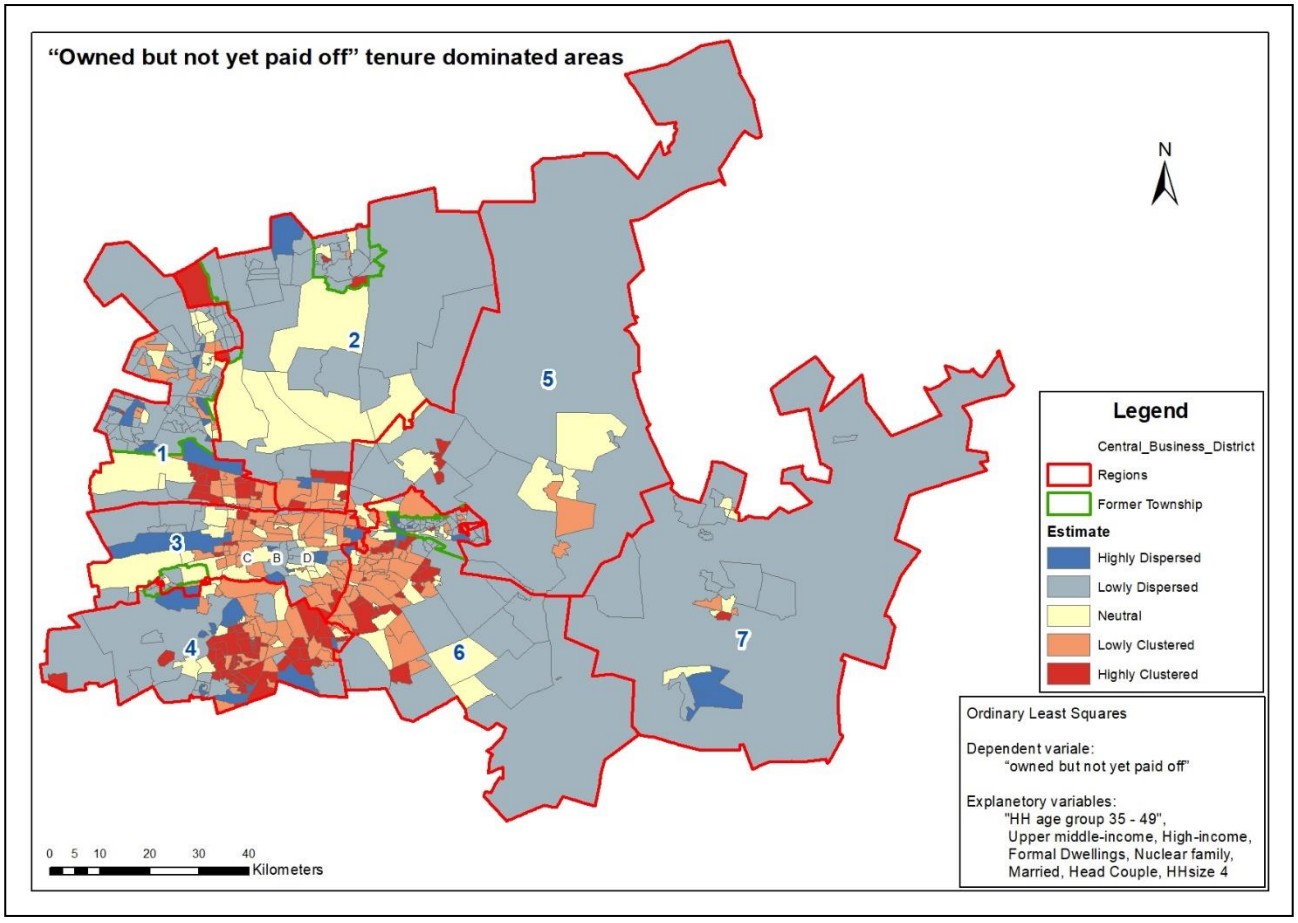

Figure 11: OLS on "Owned but not yet paid off" tenure dominated areas

It is economically viable for the "*HH age group 20 - 34*" to engage in *"rented"* tenure. However, areas dominated by "rented" tenure faced higher mobility transitions as middle-aged citizen with increasing income and household size were likely going to relocate in search for owned tenure. The high-income migrants who are at their late 30s would consider prospects of ownership as a way to achieve autonomy away from compact environments and relocate to affluent suburbs and gated communities. Table 15 indicates that about 74% of the highly clustered sub places in terms of

"Owned and not yet paid off" tenure have gated community presence. Hence, the perception is that outlying areas are associated with environmental and social benefits (Geyer and Geyer, 2014). Actually, back yarding housing accommodates most of migrant workers who are unable to afford property rents in the inner city.

Nr.	Estimate	Total Sub places	Sub places with Gated	Percent
1	Highly Clustered	103	76	73,79%
2	Lowly Clustered	157	111	70,70%
3	Neutral	92	32	34,78%
4	Lowly Dispersed	246	17	6,91%
5	Highly Dispersed	56	10	17,86%
Totals		**654**	**246**	**37,61%**

Table 15: Gated community presence in the "Owned but not yet paid off" tenure dominated areas

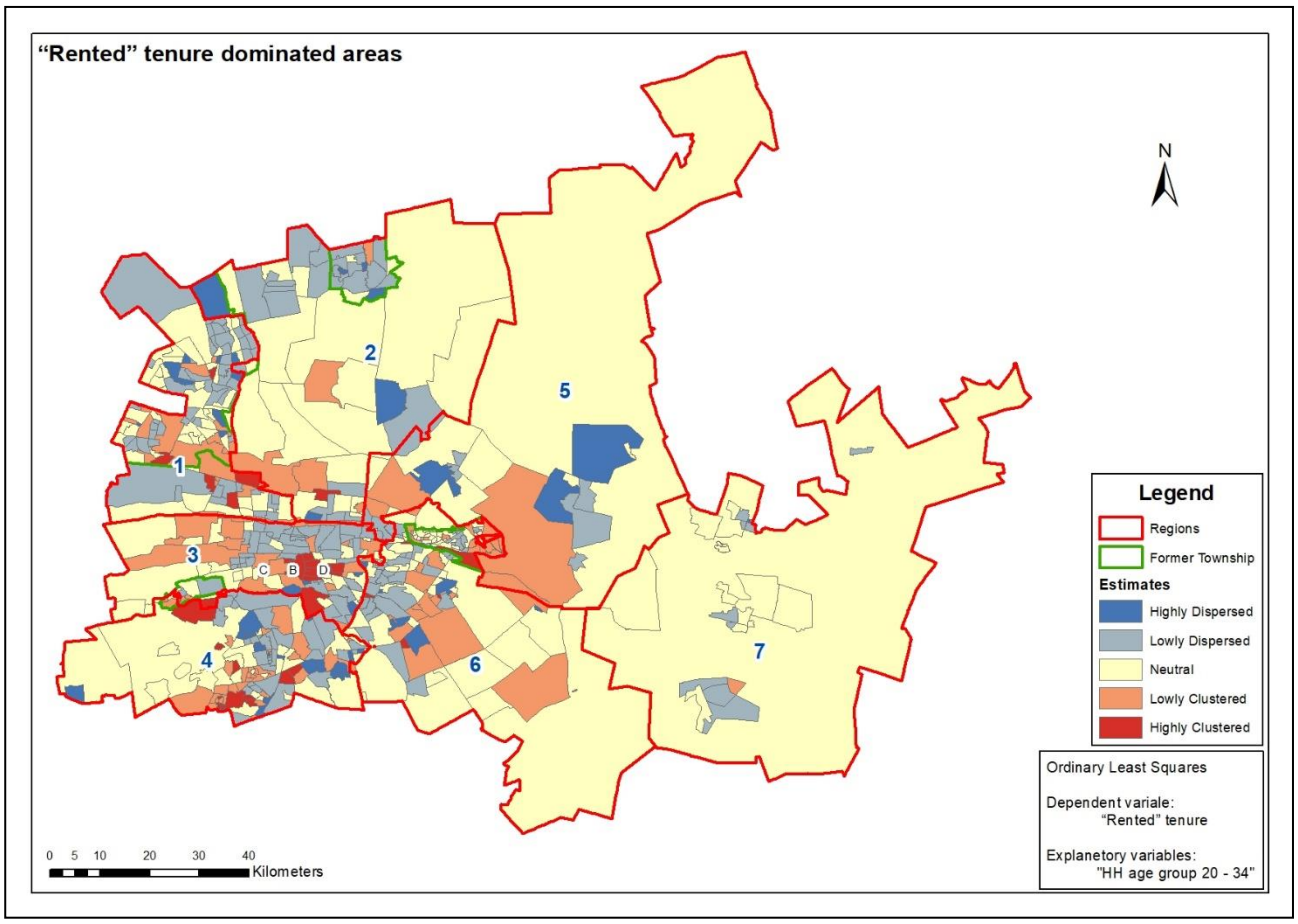

Figure 12: OLS on "Rented" tenure dominated areas

The study area was not a stagnant one, but rather a progressive and economically active region, hence economic activities are associated with drivers of influence for ownership instead of *"rented"* tenure, particularly for age groups above 35. This also confirms a suggestion made by Banks et al (2004) that individuals would prefer ownership than *"rented"* tenure in their middle ages. Consequently, figure 12 portrays "*rented*" tenure as concentrated around the CBD and in the city's outskirts. Such concentrations in the CBD is due to the settlement type coupled with numerous

number of high-rise dwelling structures, while in the outskirts, it emanated from rental of backyard rooms in the informal settlement.

Figure 13 depicts OLS on "Occupied rent-free" tenure dominated areas as located mostly adjacent the former townships and homelands. Surprisingly "*Occupied rent-free*" is neither associated with ownership nor rental, because most of these areas are no guarantee that they will last longer considering that they are informal dwellings and majority of the HH age group were young adults between ages 20 and 34. Social challenges with this type of tenure is that mobility is high, based on municipal strategic plans and decision regarding relocation and re-settlement of occupants. Thus, housing policy play critical role on the stability and well-being of the "*Occupied rent-free*" residents, i.e. permanent residential settlement depends on policy implication and the political orientation of that region.

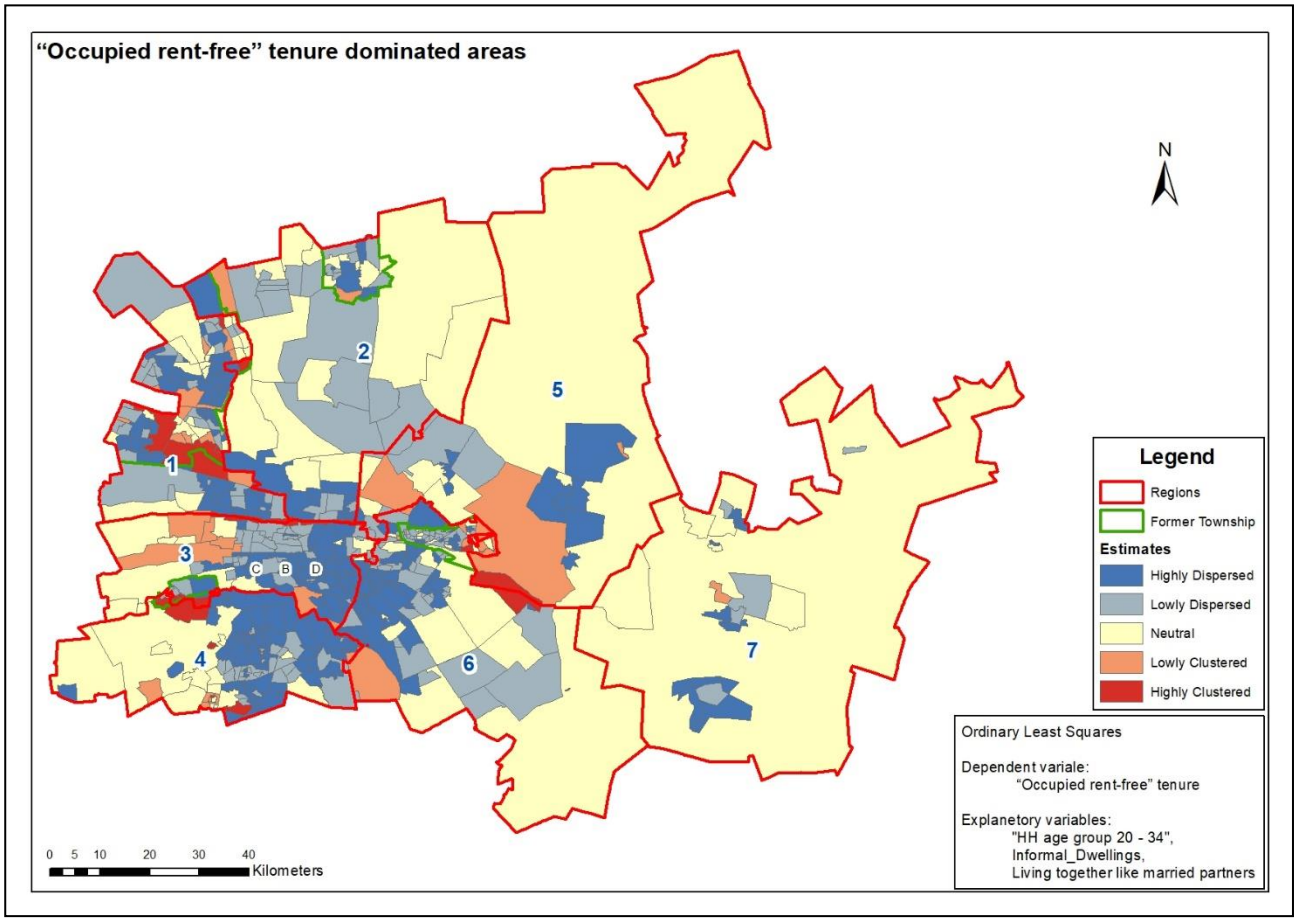

Figure 13: OLS on "Occupied rent-free" tenure dominated areas

4.5 TENURE VARIATION BETWEEN 2001 AND 2011

The study area had 501 and 654 observations for 2001 and 2011 respectively. Changes entailed comparison of population groups and age groups with relation to owned tenure in order to establish distributional patterns within the study area. There are two age groups observed in the 2011 dataset, which are population age group (normally written as just age group in this study) and household head age group (HH age group). In terms of eligible homeowners, the 2001 dataset did not contain

the "*HH age group*". Hence, tenure patterns could not be realised in terms of "*HH age group*" between 2001 and 2011. Therefore, comparison of distribution patterns of tenure involved "*population age group*" and not "*HH age group*". Moreover, population groups were critically important to tracking the changes between 2001 and 2011 censuses.

4.5.1 TENURE CHANGES BETWEEN 2001 AND 2011 CENSUSES

Figure 14 indicates a positive increase in terms of *"rented"* tenure between 2001 and 2011, while the rest of tenure types experienced a decline. Figure 15 explains the *"rented"* tenure differences based on the township status. Thus, none-former townships had a positive increasing *"rented"* rates compared with former township. *"Owned but not yet paid off" tenure* declined in the former and none-former township. The decline in the former township was explained by an increased "*Owned and fully paid"* tenure. On the contrary, there was a decline of both types of ownership in the none-former township.

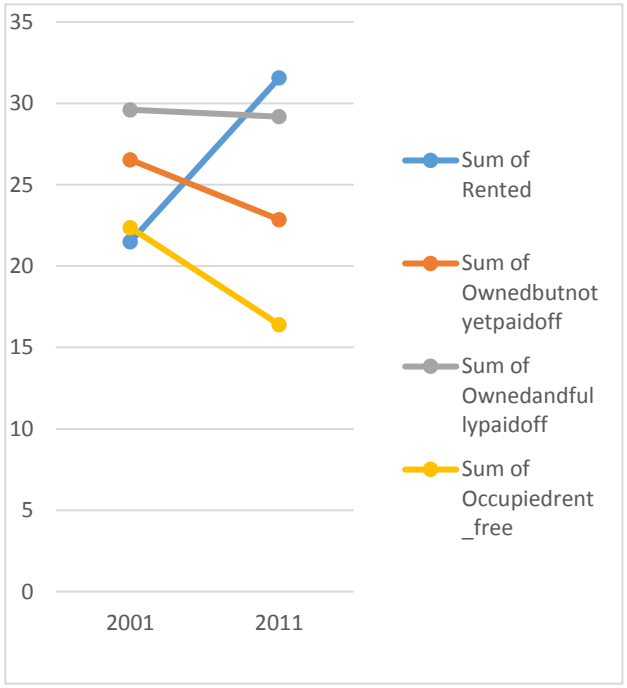

Figure 14: Tenure changes

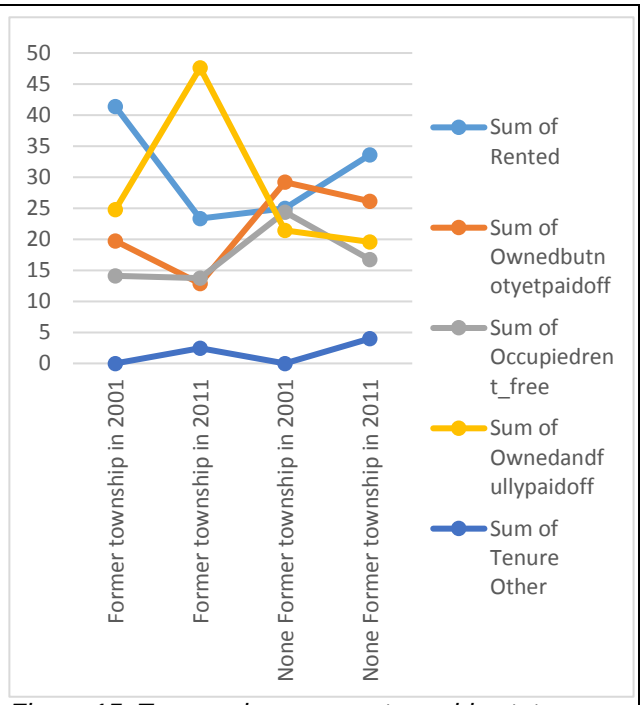

Figure 15: Tenure changes per township status

Surprisingly, figure 16 shows former township areas as dominated by low-income earners. Thus, as to how "*Owned and fully paid*" tenure was achieved remains an element that warrants further studies with assumptions that such tenure is associated with low-cost housing developments, RDP programmes and historical inherited properties. Moreover, high income dominated areas are reflected to have higher rates of *"Owned but not yet paid off"* and "*rented"* tenure.

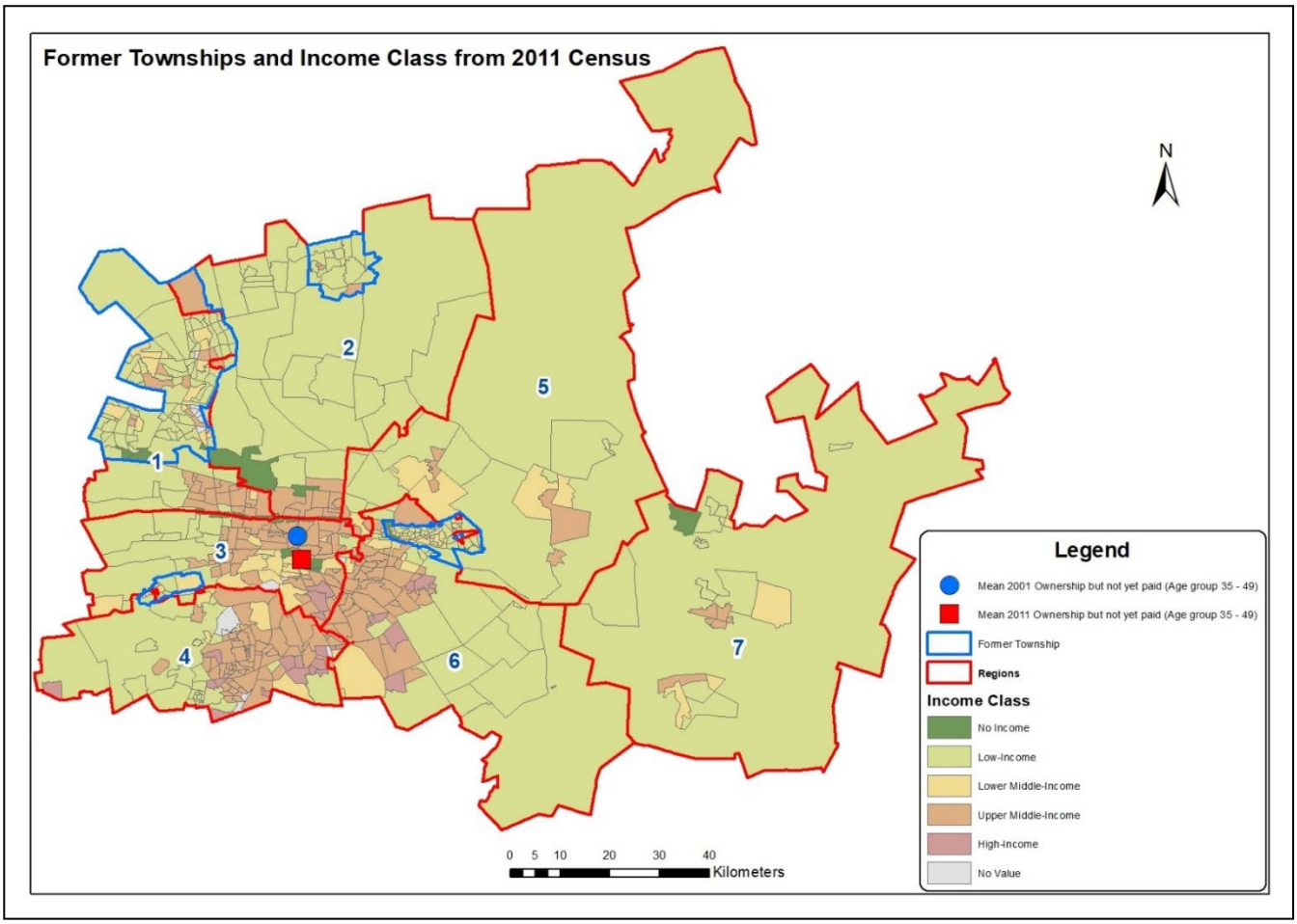

Figure 16: Former Township and income class areas

4.5.2 POPULATION GROUP CHANGES BETWEEN 2001 AND 2011 CENSUSES

Population group was critical in the manipulation of tenure distributional patterns within the study area. For example, settlement patterns in the city were, influenced by similarity of households' socio-demographic and/or economic characteristics. There has been a decline observed of the white population group between 2001 and 2011, while black African population group has been increasing ever since. The eradication of restrictive race based policies post 1994 could be the reason supporting such increase for the black community and a decline for the white community within the study area. Other population groups such as coloured and Indian or Asian, also indicated an increase. Contrary to the declining rates experienced in the study area, a closer look on the township status, reveal that there was no change observed in the former township for black African population. This means apart from the black African, there was no other population group, which had an increasing rate within the former township areas. However, between 2001 and 2011, the Black African rates increased in the areas previously dominated by other population groups. Figure 17 and 18 illustrate the growth and decline experienced by different population groups between 2001 and 2011. These results imply that there was no locational mobility of population groups in the former township compared to the none-former township, where Black African, coloured and Indian have increased between 2001 and 2011, while there is an apparent decline of the white population group.

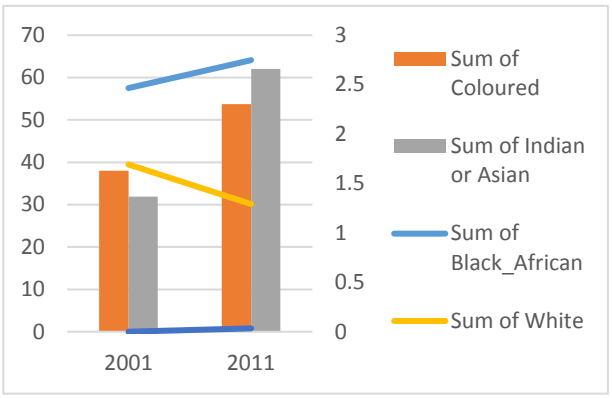

Figure 17: Population group changes

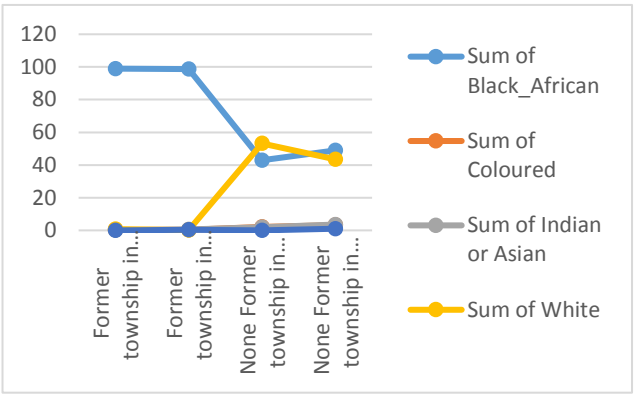

Figure 18: Population group changes per township

4.5.3 AGE GROUP CHANGES BETWEEN 2001 AND 2011 CENSUSES

An increasing number of people aged above 50 indicated the stability of the study area in terms of population demographics, but such increase was observed in both the former and none former townships. The study area seems to have also attracted a handful of people at "*HH age group 20 – 34" (refer to figure 19 and 20)* probably scholars who immigrated to the city in search for greener pastures. However, there has been a decline for "*HH age group 35 – 49*" between 2001 and 2011. There was also a decline for the population age group 0 -19. This may be the cause related to declining *"Owned but not yet paid off"* tenure. Since tenure is associated with household size, the bigger the household size, the more influence it becomes on ownership prospects. Moreover, the recession in 2008 cannot be exempt, because of its effects regarding the housing market, which in turn instilled fear to the legible new homeowners. However, with increasing unemployment rate, it is also no surprise that the study area experienced a decline of owned tenure.

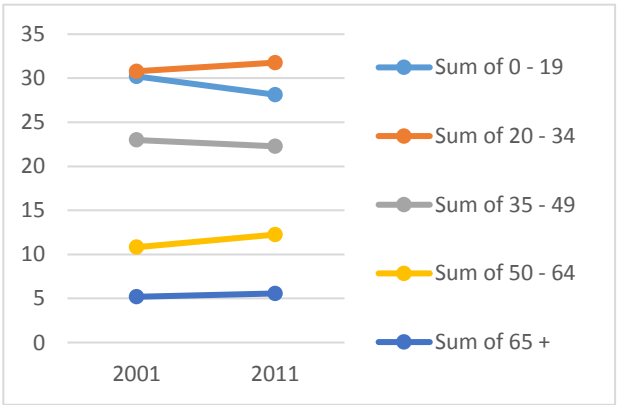

Figure 19: Age group changes

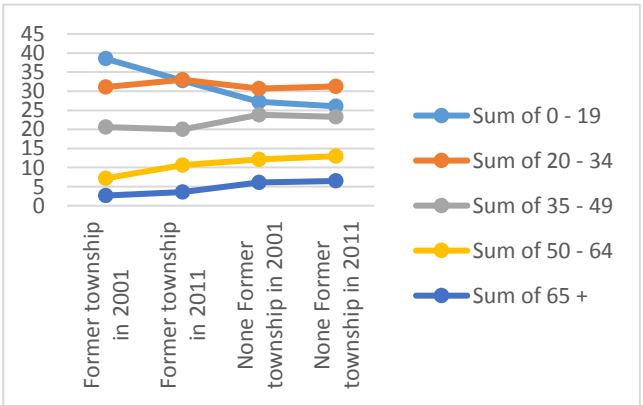

Figure 20: Age group changes per township

4.5.4 KEY FINDINGS

The study found that age was not a significant influencing factor of tenure prospects, but other factors were equally important. Moreover, tenure did not depend entirely on higher income, but all categories of income have direct or indirect impact depending on affordability measures. The RDP housing

project had to certain extent influenced owned tenure in the urban periphery or other areas commonly known as former township. Hence, considering that the data analysed had special reference to 2001 and 2011, it is envisage that the Reconstruction and Development Programme (RDP) and other subsequent policies developed in the democratic era were effective in the metropolitan in meeting the basic needs of human life such as providing shelter to the poverty-stricken communities. However, like in any other country, the metropolitan experienced high rates of "*rented"* tenure due to the increase of in-migration. Of course, this is attributable to the lifting of the discriminatory policies, which had previously prevented free movement of all races in the metropolitan.

CHAPTER FIVE: CONCLUSION AND RECOMMENDATIONS

The hypothesis of the study is partially true only in terms of "*Owned, but not fully paid off*" that was largely influenced by "*HH age group 35 – 49*". This tenure was also larger in the white population group at "*HH age group 20 – 34*" compared to other population groups, specifically due to its higher incomes. "*Owned but not fully paid off*" was highly clustered in specific areas within the study area. On the contrary, although high clusters were observed in specific areas, "*Owned and fully paid off*" tenure contradicts the hypothesis on the basis that it was larger at "*HH age group 50+*". This is categorically true considering that housing bonds are payable in full after 20 to 30 period. Hence, the stages in which households attain owned tenure varied with HH age and population groups influenced by socio-demographic and economic standings were fully established. Thus, it takes on average 15 years of active employment in the economic sector for the Black African population group to engage in owned tenure. This is based on black owned tenure dominance at ages above 35 quantified by the assumption that they became active in the employment sector at "*HH age group 20 – 34"*. On the contrary, the white population group take shorter interval within the "*HH age group 20 – 34*" to acquire owned tenure in large proportions compared to other population groups. The results confirmed a suggestion by Banks et al (2004) that individuals would prefer ownership than "rented" tenure in their middle ages even though they considered housing investment in their early life cycle as a way to secure future price volatility.

It is however unfortunate to learn that "*HH age group 35 – 49*" was not a significant determinant but relevant and its relationship with tenure was positive according to OLS regression. The results estimated that households involved in the "*Owned but not yet paid off*" tenure were mostly characterised by higher education, nuclear family, household size 4, employed, high and upper middle-income. Majority of the people engaged in "*Owned and fully paid off*" tenure lived in the study area before 2001. This links with reasons relating migration purpose and the timeframe for stay in the city because the longer the duration, the likelihood to obtain ownership.

Policy reformation surely played a critical role in the distributional pattern of tenure in the study area. For example, "*Owned and fully paid off*" tenure was dominant in the former townships than in the none-former township areas. Population groups in the former townships did not change in terms of ratio, while it was "*HH age group 50 – 64*" and "*HH age group 65+*" which were largely involved with this type of tenure. Although dominated by low-income, there was higher tenure transition from *"rented"* to ownership in the former township compared to the rest of the study area. The social wellbeing and stability of a neighbourhood is associated with owned tenure, Hence "*HH age group 35 – 49*" involved in the "*Owned but not yet paid off*" tenure by 2011, would in the future use less or none of their pension fund to settle off their home loans. Former townships have increased neighbourhood stability and well-being in terms of "*Owned and fully paid off*" Tenure, but its

properties do not provide economic stimulation and satisfaction because they are low-income dominated areas.

Ownership signifies sense of wellbeing and stability to not only households, but also affect the neighbourhood. Higher rates of mobility by young households who have increased affordability occurs specifically from the traditional, informal and inner city areas to affluent suburbs and gated communities. This explains higher rate of owned tenure of senior citizens in the former townships and homelands. This does not suggest that affluent suburbs are stable since most properties are "*Owned but not yet fully paid off"* to which banks reserve ultimate control of what occurs in such neighbourhoods should payments be defaulted. On the contrary, only those neighbourhoods which are dominated by "Owned and fully paid off" or those which would be paid off just before retirement, may simulate stability and less mobility. Moreover, result estimated an increase rate for *"rented"* tenure instead of owned tenure. As of consequences, households living in rented dwelling during their active life cycle would either relocate, upon retirement, to areas where cost of living is lower and affordable in order to avoid using larger proportion of their pension income for shelter security.

Multiple analytical approaches were required to validate and confirm the general outcomes observed in the target study area. Different analytical approaches were therefore important to triangulate the validity of the research. Correlation analysis has masked the under dynamic of regional variability leading to a skewed conclusion rather than that assumed by the study. A geographical weighted regression on the other hand presented a different perspective and proved the hypothesis true in that owned tenure is mostly attained between ages 35 and 49. However, both analysis were never going to establish spatial distributional patterns of ownership within the study area, therefore, it was necessary to consider OLS analysis. The Geographical weighed regression was employed specifically to determine which population group at which HH age group dominated tenure in varying degrees.

There is a need for further detailed study in order to ascertain facts regarding "*Owned and fully paid off*" in the low-income dominated areas. Although not quantified, the assumption is that such tenure links with to land redistribution programmes and RDP housing. It was also clear from the results that affordability could not only be attributable in monetary terms but there were other mechanism not covered in details by this study. These mechanisms include amongst others: policy reformation, state housing project and historical inherited properties. Ultimately, future study needs to also focus on the prospects of quantifying the interval it takes for different South African population groups to engage in either "*Owned but not yet fully paid off"* or "*Owned and fully paid off*" tenure.

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